



*People*                      *Vision*                      *Neighborhoods*  
                                    *Families*

*Mission*  
*To serve, protect and govern in concert with  
local municipalities*

*Values*  
*People*                      *Customer Services*  
*Ethics*                      *Resource Management*  
*Innovation*                      *Equal Opportunity*

**PURCHASING DEPARTMENT**  
**Invitation to Bid No. 06 ITB 49977K-RS**

**SW Arts Performance Theatre**  
**For**  
**General Services Department**  
**Building Construction**

**PRE-BID CONF. TIME AND DATE: 2:00 P.M. May 23, 2006**  
**PRE-BID CONF. LOCATION: SW Arts, 915 New Hope Rd.**  
**BID DUE TIME AND DATE: 11:00 A.M. July 5, 2006**  
**PURCHASING CONTACT: Rholanda Stanberry 404.730.4200**  
**E-MAIL: Rholanda.stanberry@co.fulton.ga.us**

**BID LOCATION: FULTON COUNTY PURCHASING DEPARTMENT**  
**130 PEACHTREE STREET, S.W., SUITE 1168**  
**ATLANTA, GA 30303**

**VOLUME 2 – ITB MANUAL**  
**Issued for Bid**



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Made as on the \_\_\_\_\_ day of \_\_\_\_\_, in the year of Two  
Thousand and Six.

**Between the Owner (County):**

**FULTON COUNTY BOARD OF COMMISSIONERS**  
Fulton County Government Center  
141 Pryor Street, S.W.  
Atlanta, Georgia 30303

**And the Contractor:**

**The Project:**

SW Arts Performance Theater

**The Work:**

IFB Number: 06ITB 49977K-RS  
Contract Name: SW Arts Performance Theater

**Contract Sum:** Refer to Article 9, Payments & Completion

**The Construction Manager:**

Ann Littlejohn  
General Services Department  
Building Construction  
Fulton County Government Center  
141 Pryor Street, S.W., Suite 8053  
Atlanta, Georgia 30303

**The Architect:**

Leslie Spencer  
Gardner, Spencer, Tench, Smith & Hensley  
Candler Building  
127 Peachtree Street  
Suite 1020  
Atlanta, Georgia 30303

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The Owner and the Contractor agree as set forth below:

## ARTICLE 1

### CONTRACT DOCUMENTS

1.1 DEFINITIONS - The following is a partial list of terms and their meanings as used in the administration of the project and in the Contract Documents:

1.1.1 Documents:

- A. "Bidding Documents" include (1) the Invitation for Bids, which is comprised of the Bid Manual (including Instructions to Bidders, the Bid Form, and other bidding information), the Project Manual (including the Owner-Contractor Agreement and other Contract forms, the General Requirements, the Specifications, schedules and other project information) and the Drawings which are bound separately and listed in a List of Drawings included in the Project Manual; and (2) any Addenda to the Invitation for Bids issued prior to receipt of bids.
- B. "Contract Documents" for the Work consist of the Bidding Documents and all modifications issued after award of the Contract. A modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a written interpretation issued by the Construction Manager pursuant to Subparagraph 2.3.8 of this Agreement, or (4) a written order for a minor change in the Work issued by the Construction Manager pursuant to Article 12 of this Agreement.

The Contract Documents represent the entire and integrated agreement between the parties hereto and supersede all prior negotiations, representations or agreements, either written or oral. The Contract Documents may be amended or modified only by a modification as defined in above in this Subparagraph. The Contract Documents shall not be construed to create any contractual relationship of any kind between any persons or entities other than the County, including the Construction Manager, and the Contractor. Nothing contained in the Contract Documents shall create any contractual relationship between the County, Construction Manager, or any other consultant employed by the County, and any of the Contractor's subcontractors or sub-subcontractors.

1.1.2 The Work:

The Work comprises the completed construction required of the Contractor as described in the Contract Documents, and includes all labor, materials, equipment, and services necessary to produce the constructed facility in a complete, finished and operating manner.

1.1.3 The Project:

The Project is the total construction of which the Work performed under this Contract, as described in the Contract Documents or as required by any law, ordinance, code or standard, may be a part.

1.1.4 Approve:

Where used in conjunction with the County's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of the term "approved" shall be held to limitations of the County's responsibilities and duties as described herein. In no case shall "approval" be interpreted as a release of Contractor from responsibilities to fulfill the requirements of the Contract Documents.

1.1.5 Bidder:

Any individual, company, corporation, partnership, or joint venture who submits a bid for the Work required as distinct from a sub-bidder who submits a bid to a prime bidder.

1.1.6 Directed, Required, Acceptable:

When these words refer to work or its performance, "directed", "required", "requested", "authorized", "selected", "permitted", "ordered", "designated", "prescribed", and words of like implication, mean "by direction of", the County. Likewise, "acceptable", "satisfactory", "in the judgment of", and words of like import, mean "recommended by", "acceptable to", "satisfactory to", or "in the judgment of" the County.

1.1.7 As Shown, As Indicated, As Detailed:

These words, and words of like implication, refer to information contained by drawings and/or specifications describing the Work, unless explicitly stated otherwise in other Contract Documents.

1.1.8 Manufacturer:

An individual, company, or corporation who manufactures, fabricates or assembles a standard product. A standard product is one that is not made to special design, and is furnished either directly to the Contractor or through a material supplier or vendor to the Contractor.

1.1.9 Material Supplier or Vendor:

An individual, company, or corporation who supplies, but who is not responsible for the installation of, materials, products and equipment for this particular contract.

1.1.10 Notice of Award:

This notice is provided by the County to the apparent successful Bidder, and indicates that it is the County's intent to award the Contract to that Bidder, contingent upon the Bidder's execution of the Owner-Contractor Agreement and submission of other necessary documents as specified in the Bidding Documents, and contingent upon the County's subsequent acceptance of same and formal approval of the Contract by the Fulton County Board of Commissioners.

1.1.11 Notice to Proceed:

This notice is provided by the County to the successful Bidder after the County has accepted and approved the Bidder's executed Owner-Contractor Agreement and other documents as required by and specified in the Bidding Documents. The actual date for commencement of the Work shall be extracted from the Notice to Proceed and inserted into the Agreement in the appropriate location, when the County executes the Agreement.

1.1.12 Plans or Drawings:

All drawings, sketches or reproduction of drawings pertaining to required Work.

1.1.13 Product:

The term "product" includes materials, systems and equipment.

1.1.14 Project Manual:

The Project Manual includes the Owner-Contractor Agreement and other Contract forms, the General Requirements, the Specifications, schedules and other project information, all contained in one or more volumes.

1.1.15 Bid:

A complete and properly signed document whereby a Bidder proposes to perform the Work or designated portion thereof for the sums stipulated therein, supported by all data called for by the bidding requirements and documents.

1.1.16 Provide:

As a directive to the Contractor, "provide" means "furnish and install completely."

1.1.17 Specifications:

Descriptions, provisions and requirements, pertaining to method and manner of performing work, or the quantities and qualities of materials to be furnished under the terms of the Contract.

1.2 EXECUTION, CORRELATION AND INTENT

1.2.1 Execution of this Owner-Contractor Agreement is a representation that the Contractor has visited the site, has become familiar with the local conditions under which the Work is to be performed, and has correlated personal observations with the requirements of the Contract Documents.

1.2.2 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work. The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. Work not covered in the Contract Documents shall not be required unless it is consistent therewith and is reasonably inferable therefrom as being necessary to produce the intended results. Words and abbreviations which have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings.

1.2.3 The organization of the Bid Manual and Project Manual and the Specifications provided to the Contractor into divisions, sections and articles, and the arrangement of the Drawings provided to the Contractor, shall not control the Contractor in dividing the Work among subcontractors and trades, or in establishing the extent of work to be performed by any such entity; nor shall any responsibility be assumed by the County, or Construction Manager for the manner in which the Contractor utilizes such documentation provided to divide the Work among such entities.

1.2.4 If any portion of the Contract Documents shall be in conflict with any other portion, the various documents comprising the Contract Documents shall govern in the following order of precedence: the Owner-Contractor Agreement; the General Requirements; the Technical Specifications; the Drawings. As between figures given on Drawings and the scaled measurements, the figures shall govern; as between large-scale Drawings and small-scale Drawings, the larger scale shall govern. All such discrepancies and/or conflicts shall be submitted in writing to the Construction Manager for clarification before the Contractor's Bid is submitted, so that an addendum may be issued if necessary.

1.3 OWNERSHIP AND USE OF DOCUMENTS

1.3.1 All Drawings and Specifications furnished by the Architect are and shall remain the property of the County. They are to be used by the Contractor only with respect to this Project and are not to be used on any other project. Submission or distribution of same to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the rights of the County or other reserved rights.

1.4 ASSEMBLY OF CONSTRUCTION DRAWINGS AND SPECIFICATIONS PRIOR TO NOTICE TO PROCEED

1.4.1 It is the intent of the Architect and the Construction Manager to assemble a set of Contract Documents to be used for construction which, to the greatest extent possible, incorporates all changes which may have been issued by addendum for this Contract. Every effort will be made by the Architect and the Construction Manager to have this set of Contract Documents available for the Contractor at the time the Notice to Proceed is issued. If for any reason these documents are not available at the time of issuance of the Notice to Proceed, the County may direct the Work, or certain portions thereof, to commence using the documents in their state at the time of bid. No changes will be incorporated into this reissued set of Contract Documents that were not previously issued by addendum; however, it is the responsibility of the Contractor to review this reissued set of Contract Documents and to verify that the incorporation of addendum changes has been executed properly.

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## ARTICLE 2

### ADMINISTRATION

#### 2.1 CONSTRUCTION MANAGER

##### 2.1.1 MANAGEMENT APPROACH

2.1.1.1 The County has established a process for the design and construction of infrastructure and facilities projects in its Capital Improvements Program which utilizes a team concept involving the use of a Construction Manager. The Construction Manager, in connection with a wide range of services that they provide, assist and support the County in the comprehensive program planning, organization, coordination, control, budgeting, and implementation of the design and construction of each project in the program. It is the County's intent that the Construction Manager, Architect, Engineers and Contractor work as a unified team with the County in the delivery of this project.

##### 2.1.2 THE CONSTRUCTION MANAGER

2.1.2.1 The Construction Manager is the person or entity identified as such herein. The term "Construction Manager" means the County's designated Construction Manager or the Construction Manager's authorized representative.

2.1.2.2 The County has designated a Construction Manager to be responsible for the implementation and delivery of projects within the County Capital Improvements Program. The Construction Manager's services include project-specific planning and management of design, construction, and support services required to complete projects in accordance with performance goals. The Construction Manager also is responsible for all status reporting of implementation activities, and provides technical and planning support. Specific areas of Construction Manager responsibility include 1) program and strategic planning, 2) projects definition, 3) funding coordination, 4) program priority management, 5) master scheduling, 6) project scope and performance parameters, 7) program status reporting, and 8) project monitoring and quality assurance, 9) project implementation planning, 10) procurement of design and construction contracts, 11) design services management, 12) equipment and materials procurement, 13) permitting and regulatory compliance, 14) field construction management and safety, 15) construction contract administration, 16) design and construction status reporting, 17) project records management, and 18) management information systems (MIS) for the program.

#### 2.2 THE ARCHITECT

2.2.1 The Architect is the person or entity identified as such herein. The term "Architect" means the Architect or the Architect's authorized representative.

- 2.2.2 In the event that design and engineering services are provided for the Work of this contract by more than one prime entity under contract with the County, the term "Architect" as used in this Agreement shall apply to the entity as regards that portion of the Work for which such entity provided services to the County. Nothing in this Agreement shall be construed to create any contractual or other obligation of any separate prime design and/or engineering firm to another.
- 2.3 ADMINISTRATION OF THE CONTRACT
- 2.3.1 The Construction Manager and the Architect shall provide administration services as hereinafter described.
- 2.3.2 For the administration and management of this Contract, the Construction Manager shall serve as the County's agent and representative. The Construction Manager shall advise and consult with the County and the Architect. The Construction Manager shall exercise full authority on behalf of the County for all matters pertinent to enforcement of the Contract, unless otherwise specifically excepted in this Agreement. The primary point of contact for the Contractor shall be the Construction Manager. All correspondence from the Contractor to the County related to contract administration and performance of the Work shall be forwarded through the Construction Manager, unless directed otherwise by the Construction Manager. Likewise, all correspondence and instructions to the Contractor on behalf of the County shall be forwarded through the Construction Manager.
- 2.3.3 The Construction Manager, with the assistance of the Architect, will determine in general that the construction is being performed in accordance with design and engineering requirements, and will endeavor to guard the County against defects and deficiencies in the Work.
- 2.3.4 The Architect will visit the site at intervals appropriate to the state of construction to become generally familiar with the progress and quality of the Work, and to determine in general if the Work is proceeding in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of on-site observations as the Architect, the Architect will keep the County informed of the progress of the Work, and will endeavor to guard the County against defects and deficiencies in the Work.
- 2.3.5 The Construction Manager and the Architect will not be responsible for or have control or charge of construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work, nor will they be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Construction Manager and the Architect will not be responsible for or have control or charge over the acts or omissions of the Contractor, its subcontractors, or any of their agents or employees, or any other persons performing the Work.

- 2.3.6 The County, the Construction Manager, the Architect and any other consultants employed by the County shall at all times have access to the Work. The Contractor shall provide safe facilities for such access so that they may perform their functions.
- 2.3.7 Based on the Construction Manager's observations and the Architect's recommendations regarding the Contractor's Applications for Payment, the Construction Manager shall determine the amounts owing to the Contractor, in accordance with the payment terms of the Contract, and shall issue Certificates for Payment in such amount to the County.
- 2.3.8 The Architect shall render interpretations of the Contract Drawings and Specifications necessary for the proper execution or progress of the Work. Either party to the Contract may make written requests through the Construction Manager to the Architect for such interpretations.
- 2.3.9 All interpretations of the Architect shall be consistent with the intent of and reasonably inferable from the Contract Documents and shall be in writing or in graphic form.
- 2.3.10 In matters relating to artistic effect, the interpretation of the Architect shall be final, if the County determines that it is consistent with the intent of the Contract Documents.
- 2.3.11 Except as otherwise provided in this Agreement, the resolution of any dispute or disagreement concerning a question of fact arising under this Agreement shall be decided by the Construction Manager. The Construction Manager shall reduce its decision to writing and mail or otherwise furnish a copy thereof to the Contractor. The decision of the Construction Manager shall be final and conclusive unless, within thirty (30) calendar days from the Contractor's receipt of such decision, the Construction Manager receives in its office a written appeal from the Contractor. The Construction Manager shall render a decision, which shall be final and conclusive. No decision of the Construction Manager shall be pleaded in any suit involving a question of fact arising under this Agreement, provided such decision is supported by substantial evidence and is not fraudulent, capricious, arbitrary, or so grossly erroneous as necessarily implying bad faith. In connection with any appeal proceeding under this Subparagraph, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of its appeal. Pending any final decision of a dispute or disagreement hereunder, the Contractor shall proceed diligently with the Work.
- 2.3.12 The Architect shall have authority to reject Work which does not conform to the Contract Documents, and to require special inspection and testing, but will take such action only after consultation with the Construction Manager. Subject to review by the Architect, the Construction Manager will have the authority to reject Work which does not conform to the Contract Documents. Whenever, in the Construction Manager's opinion, it is considered necessary or advisable for the implementation of the intent of the Contract Documents, the Construction Manager shall have authority to require special inspection or testing of the Work in accordance with Subparagraph 7.7.3, whether or not such Work be then fabricated, installed or completed. Neither the Architect's nor the Construction Manager's authority to act under this Subparagraph, nor any decision made by them in good faith either to exercise or not to exercise such authority,

shall give rise to any duty or responsibility of the Architect or the Construction Manager to the Contractor, any subcontractor, any of their agents or employees, or any other person performing any of the Work.

- 2.3.13 The Construction Manager will receive from the Contractor all shop drawings, product data, and samples and transmit same to the Architect for review.
- 2.3.14 The Architect will review for contract compliance or take other appropriate action upon the Contractor's submittals such as shop drawings, product data and samples, but only for conformance with the design concept of the Work and the information given in the Contract Documents. Such action shall be taken with reasonable promptness. The Architect's review of a specific item shall not indicate approval of an assembly of which the item is a component.
- 2.3.15 The Construction Manager and the Architect shall take appropriate action on Change Orders in accordance with Article 12 of this Agreement, and shall have authority to order minor changes in the Work as provided in Subparagraph 12.4.1 of this Agreement.
- 2.3.16 The Construction Manager, jointly with the Architect, shall conduct inspections to determine the dates of Substantial Completion and Final Completion, and shall receive and forward to the County for review written warranties and related documents required by the Contract Documents and assembled by the Contractor. The Construction Manager shall approve and issue Certificates for Payment upon compliance with Substantial and Final Completion requirements indicated in Article 9 of this Agreement.

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### ARTICLE 3

#### COUNTY

##### 3.1 DEFINITION

3.1.1 The County (Owner) is the person or entity identified as such herein. The term "County" means the County or the County's authorized representative. The term "County" also means any agent of the County. The terms "County" and "Owner" may be used interchangeably in the Contract Documents.

##### 3.2 INFORMATION AND SERVICES REQUIRED OF THE COUNTY

3.2.1 The County shall furnish all reasonably available site information describing the physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site.

3.2.2 Except as indicated otherwise, the County shall secure and pay for necessary easements required for the construction of permanent structures.

3.2.3 Information or services under the County's control shall be furnished by the County with reasonable promptness.

3.2.4 The County shall forward all instructions to the Contractor through the Construction Manager.

3.2.5 Upon Notice to Proceed, the County will furnish to the Contractor, free of charge, three (3) copies of the Contract Documents, including modifications thereto, and will be furnished, at actual cost of reproduction and delivery, as many additional copies as may be required. Subcontractors and vendors must obtain their copies of the Contract Documents from the Contractor from its allotment.

##### 3.3 COUNTY'S RIGHT TO STOP THE WORK

3.3.1 If the Contractor fails to correct defective Work as required by Paragraph 13.2, or persistently fails to carry out the Work in accordance with the Contract Documents, the County, by a written order signed personally or by an agent specifically so empowered by the County in writing, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the County to stop the Work shall not give rise to any duty on the part of the County to exercise this right for the benefit of the Contractor or any other person or entity. The Contractor shall bear all direct and indirect costs attributable to a work stoppage by the County in accordance with this Subparagraph 3.3.1.

##### 3.4 COUNTY'S RIGHT TO CARRY OUT THE WORK

3.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, and fails within seven (7) days after receipt of written notice from the County to commence and continue correction of such default or neglect with diligence and promptness, the County may, after four (4) days following receipt by Contractor of an additional written notice and

without prejudice to any other remedy the County may have, make good such deficiencies. In such case an appropriate Change Order shall be issued deducting from the payments then or thereafter due the Contractor for the cost of correcting such deficiencies, including compensation for the County's Agents or Professional Consultants for additional services made necessary by such default, neglect or failure. If the payments then or thereafter due the County are not sufficient to cover such amount, the Contractor shall pay the difference to the County.

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## ARTICLE 4

### CONTRACTOR

#### 4.1 DEFINITION

4.1.1 The Contractor is the person or entity identified as such herein. The term "Contractor" means the Contractor or the Contractor's designated representative.

4.1.2 The Contractor is the prime entity that provides construction services including labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, furnishings, equipment and other facilities and services for execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated into the Work. The term "Contractor" shall be taken to include the Contractor's subcontractors, sub-subcontractors, and other entities providing materials, labor and construction for execution of the Work.

4.2 *(not used)*

#### 4.3 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY THE CONTRACTOR

4.3.1 Starting upon the Contractor's receipt of the Notice to Proceed, the Contractor shall again carefully study and compare the Contract Documents and field conditions of the jobsite and shall immediately report to the Construction Manager any error, inconsistency, ambiguity or omission that may be discovered; or, if no such errors, inconsistencies, ambiguities or omissions are found, the Contractor shall so state in writing to the Construction Manager. The Contractor shall perform no portion of the Work at any time without Contract Documents or, where required, without reviewed shop drawings, product data or samples for such portion of the Work and where such review allows fabrication or installation in accordance with the Section 01 340 of the General Requirements.

4.3.2 If the Contractor has not performed a complete review of the Contract Documents within thirty (30) days since the Contractor's receipt of the Notice to Proceed, and should dimensional discrepancies, conflicts, or problems of inadequate detail be discovered after that time period has elapsed, the Contractor must report same to the Construction Manager immediately, and then proceed to rectify such dimensional discrepancies, conflicts, or problems of inadequate detail. However, if the dimensional discrepancies, conflicts, or problems of inadequate detail which are discovered after that time period has elapsed are due to the Contractor's failure to properly research and review the Contract Documents, the Contractor will be completely responsible for all additional direct and indirect costs associated with the resolution of the dimensional discrepancies, conflicts, or problems of inadequate detail, if any costs should occur. Additional costs are those direct and indirect costs which are above and beyond the costs which would have been incurred by the County, had there been no occurrence of dimensional discrepancy, conflict, or problem of inadequate detail.

4.3.3 In the event that dimensional discrepancies, conflicts, or problems of inadequate detail are discovered after the expiration of the 30-day period, which could not reasonably have been discovered by the Contractor's thorough review of the Contract Documents as required by this Paragraph 4.3, the County will accept a proposal from the Contractor for the direct costs associated with these problems, provided that the Contractor can fully substantiate its direct costs according to the requirements of Article 12 of this Agreement.

#### 4.4 SUPERVISION AND CONSTRUCTION PROCEDURES

- 4.4.1 The Contractor shall provide qualified personnel to supervise and direct the Work. The Contractor shall be solely responsible for all construction, fabrication, delivery, erection, installation, means, methods, techniques, sequences and procedures, and shall coordinate all portions of the Work.
- 4.4.2 The Contractor shall be responsible to the County for the acts and omissions of the Contractor's officers, directors, employees, subcontractors, suppliers, and their agents and employees, and any other persons performing any of the Work.
- 4.4.3 The Contractor shall not be relieved from obligations to perform the Work in accordance with the Contract Documents, either by the activities or duties of the Architect, the Construction Manager in the administration of the Contract, or by inspections, tests or reviews required or performed by persons other than the Contractor.
- 4.5 LABOR AND MATERIALS
- 4.5.1 The Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.
- 4.5.2 The Contractor shall at all times enforce strict discipline and good order among the Contractor's employees and shall not employ on the Work any unfit person or anyone not skilled in the task assigned them.
- 4.5.3 After the Owner-Contractor Agreement has been executed, the Construction Manager and the Architect will consider a request for the substitution of materials or equipment in place of those specified only if the Contractor can demonstrate that the material or equipment specified is no longer available, or that the delivery date of specified product is such that the scheduled date of Substantial Completion of the Work will be delayed if the specified product remains a requirement. Refer to Section 01 630 of the General Requirements for additional details and instructions regarding substitutions after contract execution.
- 4.6 WARRANTY
- 4.6.1 The Contractor warrants to the County that all materials and equipment furnished under this Contract shall be new unless otherwise specified, and that all Work shall be of good, first quality, free from faults and defects. All Work not conforming to these requirements, including substitutions not properly approved and authorized by the County, may be considered defective. If required by the County, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. This warranty is not limited by the provisions under Paragraph 13.2 of this Agreement.
- 4.7 TAXES
- 4.7.1 The Contractor shall pay all sales, consumer, use and other similar taxes for the Work or portions thereof provided by the Contractor which are legally enacted at the time proposals or bids are received, whether or not yet effective at time of bid.
- 4.8 PERMITS, FEES AND NOTICES
- 4.8.1 The Contractor shall apply for, pay for and secure all permits required for the proper execution of the Work, including all required land disturbance, demolition, and building permits issued by Fulton County and/or any other authority having jurisdiction. The Contractor shall secure and pay for all other permits and governmental fees required to execute the Work, including but not limited

to licenses and inspections necessary for the proper execution and completion of the Work, and for the occupancy of the Work upon Substantial Completion and which are legally required at the time bids are received.

- 4.8.1.1 Other permits required by any department of Fulton County Government, or any other jurisdiction must be paid for and obtained by the Contractor.
  - 4.8.1.2 Contractor shall be responsible for obtaining interim and/or final Certificates of Occupancy from the authority having jurisdiction. The Contractor shall be responsible for all costs which may be necessary in order to obtain these certificates.
  - 4.8.1.3 Contractor shall be responsible for acquiring and installing water and sewer taps for the project including all fees. Cost of meters and other materials and labor shall be the responsibility of the Contractor.
- 4.8.2 The Contractor shall give all notices and comply with all laws, codes, ordinances, rules, regulations and lawful orders of any public authority having jurisdiction which bear on the performance of the Work. The Construction Manager shall be notified within two (2) days in writing of any jurisdiction observations or inspections that require changes to the design and engineering requirements in the Contract Documents.
- 4.8.3 It is not the responsibility of the Contractor to make certain that the Contract Documents are in accordance with applicable laws, statutes, building codes and regulations. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, the Contractor shall promptly notify the Construction Manager in writing, and any necessary changes shall be accomplished by appropriate modification. All necessary modifications shall be issued to the Contractor in writing by the Construction Manager.
- 4.8.4 If the Contractor performs any Work knowing it to be contrary to applicable laws, statutes, building codes, and regulations, and such Work is performed without notice of such having been made to the Construction Manager, the Contractor shall assume full responsibility therefor and shall bear all direct and indirect costs and liabilities attributable thereto.

#### 4.9 ALLOWANCES

- 4.9.1 The Contractor shall include in the contract sum all allowances stated in the Contract Documents. Descriptions of allowances, if any, are found in Section 01 020 of the General Requirements.
- 4.9.2 The total amount of each allowance is exclusively for County use. The Contractor shall not include any mark-up within the allowance amount, although applicable mark-up may be included in the total Contract Sum.

#### 4.10 SUPERINTENDENT

- 4.10.1 The Contractor shall employ a competent, full time, experienced superintendent and necessary assistants who shall be in attendance at the Project site during the progress of the Work. The superintendent shall have project experience comparable to the Contract scope, type, size and cost and shall have full authorization by the Contractor to fully represent the Contractor. All communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be so confirmed on written request in each case.

- 4.10.2 The superintendent shall remain on the Project not less than eight (8) hours per day, five days per week minimum, unless the job is closed down due to a general strike or conditions beyond the control of the Contractor, or until Termination of the Contract in accordance with the Contract Documents. The superintendent shall not be employed on any other Project during the course of this Work.
- 4.10.3 The superintendent or project supervisor shall be satisfactory to the Construction Manager and shall not be changed except with the consent of the Construction Manager, unless the superintendent proves to be unsatisfactory to the Contractor and ceases to be in his employ. At any time during the execution of the Work, should the superintendent become unsatisfactory to the Construction Manager, the Contractor shall within 15 (fifteen) days upon receiving written notice from the Construction Manager, remove and replace the superintendent. Any such replacement superintendent shall be satisfactory to the Construction Manager.
- 4.10.4 In the event that any of the following conditions shall exist, the Contractor shall require that its superintendent be at the job site not less than ten (10) hours per day, six (6) days per week. This shall be done at no additional cost to the County.
- 4.10.4.1 should Substantial Completion not be accomplished on schedule;
- 4.10.4.2 should Final Completion not be accomplished on schedule;
- 4.10.4.3 should a schedule review show the Contractor to be fourteen (14) or more days behind schedule at any time during construction up until 30 days prior to a scheduled Substantial Completion;
- 4.10.4.4 should the schedule review show the Contractor to be seven (7) or more days behind schedule at any time during the last thirty (30) days prior to scheduled Substantial Completion.
- 4.10.5 The Contractor's superintendent shall document work activities and conditions on a daily basis. Reference Section 01 320 of the General Requirements for procedural details.
- 4.11 CONTRACTOR'S CONSTRUCTION SCHEDULE
- 4.11.1 The Contractor shall prepare and submit for the Construction Manager's review a detailed Contractor's Construction Schedule for the Work, which shall provide for expeditious and practicable execution of the Work. The schedule shall not exceed time limits indicated under this Agreement and shall be revised at intervals as required by conditions of the Work and the Project. Schedules shall be kept current and updated and submitted monthly with a written report of changes. The Contractor shall also submit to accompany the construction schedule, a schedule showing percentage amount of work completed and dollar value for each month of construction. Reference Section 01 310 of the General Requirements for procedural details.
- 4.11.2 The Contractor shall prepare and keep current, for the Construction Manager's review, a schedule of submittals which is coordinated with the Contractor's construction schedule. Schedule shall show submittal date, date sent to Construction Manager, date received from Construction Manager, dates of receipt from and return to subcontractors and suppliers, and action taken.
- 4.12 *(not used)*
- 4.13 DOCUMENTS AND SAMPLES AT THE SITE
- 4.13.1 The Contractor shall maintain at the Project site, on a current basis, one record copy of all Drawings, Specifications, Shop Drawings, Samples, Product Data, Addenda, Change Orders,

Modifications and other documents related to the Work in good order and marked currently to record all changes made during construction. These shall be available to the Architect and the Construction Manager for review at any time and shall be delivered to the Construction Manager for submittal to the County upon completion of the Work. The Contractor shall advise the Construction Manager on a current basis of all changes in the Work made during construction.

**4.14 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES**

4.14.1 The Contractor shall prepare and submit to the Construction Manager, per the procedures contained in Section 01 340 of the General Requirements, a comprehensive Submittal Register for review and approval by the Construction Manager.

4.14.2 The Contractor shall prepare, review, approve and submit to the Architect, through the Construction Manager, with reasonable promptness and in such sequence as to cause no delay in the Work or to any separate contractor, all Shop Drawings, Product Data and Samples required by the Contract Documents for review. The Contractor shall coordinate its Shop Drawings, Product Data and Samples with those of other separate contractors, if any. Reference Section 01 340 of the General Requirements for definitions and procedural details.

4.14.3 By approving and submitting Shop Drawings, Product Data, and Samples, the Contractor represents that it has determined and verified all materials, field measurements and field construction criteria related thereto, or shall do so with reasonable promptness, and has checked and coordinated the information contained within such submittals between all trades and with the requirements of the Work, the Project and the Contract Documents.

4.14.4 The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Architect's review of Shop Drawings, Product Data or Samples, unless the Contractor has clearly and specifically informed the Architect in writing of such deviation at the time of submission and the Architect has taken no exception to the specific deviation. The Contractor shall not be relieved of responsibility for errors and omissions in the Shop Drawings, Product Data or Samples by the Architect's review.

4.14.5 The Contractor shall make any corrections required by the Architect and shall resubmit the required number of corrected copies of Shop Drawings/Product Data or new Samples. Resubmittal of Shop Drawings, Product Data, or Samples necessitated by required corrections shall not be cause for an extension of time. The Contractor shall direct specific attention in writing on resubmitted Shop Drawings, Product Data or Samples to revisions other than the corrections requested on previous submittals.

4.14.6 Resubmitted Shop Drawings, Product Data, or Samples necessitated by required corrections due to nonconformance with the Contract Documents which contain the same nonconformity as the first submittal shall be reviewed with the Contractor's understanding that all associated labor costs of said review will be back-charged to the Contractor, and drawn against the next sequential payment application.

**4.15 USE OF SITE**

4.15.1 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents, and shall not unreasonably encumber the site with any materials or equipment. The Contractor shall control accessibility to the site and not unreasonably impede the normal flow of traffic in the vicinity, including truck and equipment entrances, allowable use of contiguous sidewalks and streets, and parking facilities. Reference Section 01 500 of the General Requirements for details.

**4.16 CUTTING AND PATCHING / EXISTING STRUCTURES AND UTILITIES**

- 4.16.1 The Contractor shall be responsible for all cutting, fitting or patching that may be required to complete the Work.
- 4.16.2 The Contractor shall not damage or endanger any portion of the Work or the work of the County or any separate contractors by cutting, patching or otherwise altering any Work, or by excavation. The Contractor shall not cut or otherwise alter the work of the County or any separate contractor except with the written consent of the County and of such separate contractor. The Contractor shall not unreasonably withhold from the County or any separate contractor consent to cutting or otherwise altering the Work. Reference Section 01 045 of the General Requirements for details regarding cutting and patching.
- 4.16.3 The Contractor shall coordinate and be responsible for any modifications to existing structures which may be required to complete the Work.
- 4.16.4 Construction operations that require physical connection to existing operating buildings or structures and/or affect air quality, noise or utilities, shall be maintained so as to not interfere with any existing ongoing building operations.
- 4.16.5 The Contractor shall coordinate and be responsible for all modifications and connections to the existing utilities, as well as be responsible to coordinate any upgrades and new utility work.
- 4.17 CLEANING UP
- 4.17.1 The Contractor shall at all times keep the premises free from accumulation of waste materials or rubbish caused by the Contractor's operations, and shall adhere to all of the terms of the General Requirements. At the completion of the Work, the Contractor shall remove all the waste materials and rubbish from and about the Project as well as all the tools, construction equipment, machinery and surplus materials.
- 4.17.2 If the Contractor fails to clean up adequately, the County may do so as provided in Paragraph 3.4 of this Agreement, and the cost thereof shall be charged directly as a deduct to the Contract Sum.
- 4.18 COMMUNICATIONS
- 4.18.1 The Contractor shall forward all communications to the County and the Architect through the Construction Manager.
- 4.19 COPYRIGHT, ROYALTIES AND PATENTS
- 4.19.1 The Contractor shall pay all royalties and license fees, shall defend all suits or claims for infringement of any patent rights, and shall hold the County, the Architect, the Construction Manager, and other consultants of the County for the Project, and their agents and employees, harmless from loss on account thereof. If the Contractor has reason to believe that the design, process or product selected is an infringement of a patent, it shall be responsible for such loss unless such information is promptly given to the County.
- 4.20 INDEMNIFICATION
- 4.20.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the County, the Architect, the Construction Manager, and other consultants of the County for the Project, and their agents and employees from and against any and all claims, damages, losses and expenses, including, but not limited to, attorneys' fees and claims for contribution arising out of, resulting from or related to the performance of the Work, provided that any and all such

claims, damages, losses or expenses are caused in whole or in part by any act, error, omission, or negligence of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this Paragraph 4.20.

- 4.20.2 In any and all claims against any person or entity indemnified under this Paragraph 4.20 by any officer, director, or employee of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Paragraph 4.20 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

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## ARTICLE 5

### SUBCONTRACTORS

#### 5.1 DEFINITIONS

- 5.1.1 A subcontractor is a person or entity who has a direct contract with the Contractor to perform any portion of the Work. The term "subcontractor" means a subcontractor or an authorized representative thereof. The term "subcontractor" does not include any separate contractor who may be hired by the County or the Construction Manager or any separate contractor's subcontractors.
- 5.1.2 A sub-subcontractor is a person or entity who has a direct or indirect contract with a subcontractor to perform any portion of the Work. The term "sub-subcontractor" means a sub-subcontractor or an authorized representative thereof.

#### 5.2 SUBCONTRACTUAL RELATIONS

- 5.2.1 By an appropriate written agreement, the Contractor shall require each subcontractor, to the extent of the Work to be performed by the subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes toward the County, the Architect, and the Construction Manager. Said agreement shall preserve and protect the rights of the County, the Architect and the Construction Manager under the Contract Documents with respect to the Work to be performed by the subcontractor so that the subcontracting thereof will not prejudice such rights, and shall allow to the subcontractor, unless specifically provided otherwise in the Contractor-Subcontractor agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by these Documents, has against the County. Wherever appropriate, the Contractor shall require each subcontractor to enter into similar agreements with their sub-subcontractors.
- 5.2.2 The Contractor shall make available to each proposed subcontractor, prior to the execution of such entities' agreement with the Contractor, copies of the Contract Documents to which the subcontractor will be bound by this Paragraph 5.2, and identify to the subcontractor any terms and conditions of the proposed agreement which may be at variance with the Contract Documents. Each subcontractor shall similarly make copies of such Documents available to their sub-subcontractors, who shall also be bound therein.
- 5.2.3 In the event that a subcontractor or sub-subcontractor fails to perform as required according to the Contract Documents, the Contractor, at the written direction of the County or the Construction Manager and after such notice as is proper according to the Contract Documents, shall direct and guarantee the removal or replacement of said subcontractor or sub-subcontractor at no cost to the County. If desired by the County, the work which was to be performed by the subcontractor or sub-subcontractor shall then be removed from the Contractor's Work and shall be performed by contractors working directly for either the County or the Construction Manager.

5.3 AWARDS OF SUBCONTRACTS

- 5.3.1 Unless otherwise required by the Contract Documents or the Bidding Documents, the Contractor, within ten (10) days after the receipt of the Notice of Award of the Contract, shall furnish to the Construction Manager in writing for review by the County, the Architect, and the Construction Manager, the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Work and executed Contract Compliance Exhibits C, D and E. This requirement shall be coordinated with the requirement for a similar submittal described in Subparagraph 4.5.3 above.
- 5.3.2 The Construction Manager will promptly reply to the Contractor in writing stating whether or not the County, the Architect or the Construction Manager, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Construction Manager to reply within ten (10) days shall constitute notice of no reasonable objection.
- 5.3.3 The Contractor shall not contract with any such proposed person or entity to whom the County, the Architect, or the Construction Manager has made reasonable objection under the provisions of this Paragraph 5.3.
- 5.3.4 If the County, the Architect, or the Construction Manager has reasonable objection to any such proposed person or entity, the Contractor shall submit a substitute to whom the County, the Architect, and the Construction Manager have no reasonable objection, and the Contract Sum shall be increased or decreased by the difference in costs occasioned by such substitution and an appropriate Change Order shall be issued; however, no increase in the Contract Sum shall be allowed for any such substitution unless the Contractor has acted responsively within ten (10) days by submitting name as required by Subparagraph 5.3.1.
- 5.3.5 The Contractor shall make no substitution for any subcontractor, person, or entity previously selected if the County, the Architect, or the Construction Manager make reasonable objection to such substitution.

## ARTICLE 6

### WORK BY COUNTY OR BY SEPARATE CONTRACTORS

#### 6.1 COUNTY'S RIGHT TO PERFORM WORK AND TO AWARD SEPARATE CONTRACTS

6.1.1 The County reserves the right to perform work related to the Project with the County's own forces, and to award separate contracts in connection with other portions of the Project, other work on the site under these or similar conditions of the Contract, or work which has been extracted from the Contractor's work by the County.

6.1.2 When separate contracts are awarded for different portions of the Project or other work on the site, the term "separate contractor" in the Contract Documents in each case shall mean the contractor who executes each separate County Agreement.

6.1.3 Prior to any separate contractor starting work, the County shall require that such separate contractor submit an executed insurance certificate indicating all coverages required by the separate contractor's Contract Documents are in effect, or otherwise be covered under the County's Owner-Controlled Insurance Program.

#### 6.2 MUTUAL RESPONSIBILITY

6.2.1 The Contractor shall afford the County and separate contractors reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their work, and shall connect and coordinate the Work with theirs as required by the Contract Documents.

6.2.2 If any part of the Contractor's Work depends for proper execution or results upon the work of the County or any separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report within fourteen (14) days to the Construction Manager any apparent discrepancies or defects in such other work that render it unsuitable for such proper execution and results. Failure of the Contractor to so report in writing shall constitute an acceptance of the County's or separate contractor's work as fit and proper to receive the Work, except as to any defects which may subsequently become apparent in such work by others.

6.2.3 Any costs caused by defective or untimely work shall be borne by the party responsible therefor.

6.2.4 Should the Contractor wrongfully cause damage to the work or property of the County, or to other work or property on the site, the Contractor shall promptly remedy such damage.

6.2.5 Should the Contractor be caused damage by any other contractor on the Project, by reason of such other contractor's failure to perform properly his contract with the County, no action shall lie against the County or the Construction Manager, and neither the County nor the Construction Manager shall have liabilities therefore, but the Contractor may assert his claim for damages against such other contractor as the third party beneficiary under the contract between such other contractor and the County or the Construction Manager.

If, after reasonable attempts at resolution, the Contractor and any separate contractor involved in such a third party damages claim are unable to resolve such dispute, the Construction Manager shall intervene to assist the parties in the settlement of such claims. The Construction Manager may make monetary determinations as necessary in order to resolve the issue. Such determinations shall be final. Such action shall in no way prejudice the County's position as stated in the preceding paragraph or elsewhere in the Contract Documents.

- 6.2.6 Where the Work of this Contract shall be performed concurrently in the same areas as other construction work, the Contractor shall, with the supervision of the Construction Manager, establish a mutually acceptable schedule and procedures that shall permit all jobs to proceed with minimum interference.
- 6.3 COUNTY'S RIGHT TO CLEAN UP
  - 6.3.1 If a dispute arises between the Contractor and separate contractors as to their responsibility for cleaning up, the County may clean up and charge the cost thereof to the Contractor or contractors responsible therefore as the Construction Manager shall determine to be just.

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## ARTICLE 7

### MISCELLANEOUS PROVISIONS

- 7.1 GOVERNING LAW & FORUM SELECTION
- 7.1.1 The Contract shall be governed by the laws of the State of Georgia and all other applicable local laws and statutes unless indicated otherwise.
- 7.1.2 The Contract shall be deemed to have been made and performed in Fulton County, Georgia. All suits or causes of action that may arise out of the Contract shall be brought in the courts of the State of Georgia in Fulton County.
- 7.1.3 The Georgia Open Records Act, O.C.G.A. § 50-18-70 et seq, applies to this Agreement. Contractor acknowledges that any documents or computerized data provided to the County by the Contractor may be subject to release to the public. Contractor also acknowledges that documents and computerized data created or held the Contractor in relation to this Agreement may be subject to release to the public, to include documents turned over to the County. Contractor shall cooperate with and provide assistance to the County in rapidly responding to the Open Records Act requests no later than 24 hours following receipt of any such requests by Contractor. Contractor shall promptly comply with the instructions or requests of the County in relation to responding to Open Records Act requests.
- 7.2 SUCCESSORS AND ASSIGNS
- 7.2.1 The County and the Contractor respectively bind themselves, their partners and successors, to the other party hereto and to the partners and successors of such other party with respect to all covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract, or the proceeds therefrom, or sublet it as a whole without the written consent of the other.
- 7.3 WRITTEN NOTICE
- 7.3.1 All notices shall be in writing and delivered in person or transmitted by certified mail, postage prepaid, to the person and address provided herein. Any notice transmitted according to this Paragraph 7.3 shall be deemed to have been delivered as required by the contract. If delivered in person, the notice shall be effective as of the date of such delivery. If transmitted by mail, the notice shall be effective as of the date it is placed in the mail by the sender.
- 7.3.2 Written notices to the County, relative to the project, shall be made through the Construction Manager:
- Fulton County  
General Services | Building Construction  
Fulton County Government Center  
141 Pryor Street SW, Suite 8053  
Atlanta, GA 30303  
Attn: Ann Littlejohn
- 7.3.3 Written notices to the Contractor relative to this contract shall be sent to:

7.4 NOTICE OF CLAIMS

7.4.1 If the Contractor contends that it has suffer injury or damage to person or property because of any act or omission of the County or any of the County's employees, agents, or others for whose acts the County is legally liable, notice of claim shall be made by the Contractor in writing within ten (10) days after the first observance of such perceived injury or damage.

7.4.2 If the Contractor contends it is entitles to an increase in the Contract Sum, or an extension of the Contract Time, or contends it has any other claim for monetary compensation, damages or time extensions from the Owner, the Contractor shall give the Owner written notice of such claim within ten (10) days after the occurrence giving rise to such claim.

7.4.3 The notice requirements under Articles 7.4.1 and 7.4.2 are conditions precedent to the assertion of any claim by the Contractor. If the Contractor fails to give the Owner timely written notice of a claim, as required by Articles 7.4.1 and 7.4.2, the Contractor will be deemed to have waived the claim, and the Owner shall have no further liability respecting the claim. The right of the Owner to receive notice of claims under Articles 7.4.1 and 7.4.2 may not be waived or modified by the Owner except in writing, and the Contractor shall not rely on any purported waiver of this notice requirement by verbal instructions or other conduct of the Owner.

7.5 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

7.5.1 The Contractor is required to furnish a Labor and Materials Payment Bond and a Performance Bond in penal sums of at least the full amount of the Contract, issued by a surety registered to do business in the State of Georgia and acceptable to the County. These bonds shall secure the faithful performance of the Contract, and the payment of all persons, firms or corporations to whom the Contractor may become legally indebted for professional services, construction labor, materials or equipment of any nature employed or used by it in performing the Work.

7.5.2 The bonds shall be written on forms acceptable to the County. Refer to Section 00 610 of the Project Manual for required terms and conditions.

7.5.3 Bonds shall be made out to Fulton County, Georgia.

7.6 RIGHTS AND REMEDIES

7.6.1 The duties and obligations imposed by the Owner-Contractor Agreement and the rights and remedies available thereunder shall be in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.

7.6.2 No action or failure to act by the County, the Architect, the Construction Manager, or the Contractor shall constitute a waiver of any right or duty afforded any of them under the Contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

7.7 TESTS AND INSPECTIONS

7.7.1 All testing and inspection, whether required by the specification sections or by laws, ordinances, rules, regulations, codes or orders of any public authority having jurisdiction, or whether performed by the Contractor for quality control, shall be at the Contractor's expense unless otherwise indicated in the Contract Documents. The Contractor shall procure and pay for the services of an independent testing and inspection agency registered in Georgia, and acceptable to and for the County. The Contractor shall submit testing and inspection agency qualifications and a comprehensive work plan specific to project to the Construction Manager, with a listing of

testing and inspection work required by the Contract Documents, all of which shall be reviewed and accepted by the Construction Manager prior to commencement of any testing or inspection services. Services shall include but not be exclusive of the following:

- 7.7.1.1 Soils (below pavement, foundations and slabs)
- 7.7.1.2 Foundations (subgrade preparation, reinforcement and concrete)
- 7.7.1.3 Concrete work (subgrade preparation, reinforcement and concrete)
- 7.7.1.4 Structural steel connections
- 7.7.1.5 Masonry/Reinforced Masonry
- 7.7.1.6 Welding
- 7.7.1.7 Paving (subgrade preparation, installation )
- 7.7.2 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested or approved, the Contractor shall give the Construction Manager **forty-eight (48) hours advance notice** of its readiness so the Construction Manager and/or other representative of the County may observe such inspection, testing or approval. The Contractor shall bear all costs of such inspections, tests or approvals conducted by public authorities.
- 7.7.3 If the County, the Architect, the Construction Manager, or public authority having jurisdiction determines that any Work requires special inspection, testing or approval which this Paragraph 7.7 does not include, the Construction Manager shall, upon written authorization from the County, instruct the Contractor to make arrangements for such special inspection, testing or approval, by an entity acceptable to the County, and the Contractor shall give notice as provided in Subparagraph 7.7.2 above. If such special inspection or testing reveals a failure of the Work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the Architect's, the Construction Manager's and/or other consultant's additional services made necessary by such failure, if any; otherwise the County shall bear such costs, and an appropriate Change Order shall be issued.
- 7.7.4 Required certificates of inspection, testing or approval shall be secured by the Contractor and the Contractor shall promptly deliver them to the Construction Manager.
- 7.7.5 If the County, the Architect, the Construction Manager, or other consultant wishes to observe the inspections, tests or approvals required by the Contract Documents, they shall do so promptly and, where practicable, at the source of supply.
- 7.7.6 In the event notice of readiness pursuant to Subparagraph 7.7.2 above, shall have been issued prematurely by the Contractor, his action shall be deemed to be a "false start," and the Contractor shall be liable for the damage resulting from the aforesaid false start, including but not limited to, the salary, professional fees and travel and living expenses of the persons or parties inconvenienced by the false start.
- 7.7.7 Neither the observations of the County, the Architect, or the Construction Manager, in their administration of the Contract, nor inspections, tests or approvals by persons other than the Contractor, shall relieve the Contractor from his obligations to perform the work in accordance with the Contract Documents.

- 7.7.8 Re-inspections and re-tests to confirm compliance after corrections have been made shall be paid for by the Contractor.
- 7.7.9 All references to standard specifications, American National Standards Institute (ANSI) Standards, American Society for Testing and Materials (ASTM) Standards, or standard methods, trade association standards, or other material of like character in the Contract, shall mean the latest revision or edition of the pertinent standard or specification in effect as of the date of bid submission unless a specific date is established in the Contract Documents.
- 7.7.10 Where these methods (ASTM designations; other test standards) or criteria have not been stipulated in the Contract Documents, the Contractor may contest the applicability of methods or criteria to be used or which have been used.
- 7.7.11 If any test indicates a failure to comply with Contract requirements, the Contractor, at its own expense and subject to the following conditions, may promptly undertake counter-testing for the purpose of demonstrating compliance with Contract requirements.
- 7.7.12 Counter-tests shall be undertaken and concluded within fourteen (14) days after notice to Contractor of failure of previously conducted tests. The testing agency shall be selected by the Contractor, but shall be subject to approval by the County, the Architect, and/or the Construction Manager. Quantity and nature of counter-tests shall be determined by the County after consultation with the Contractor and others. The tests may be observed by the County's representatives and timely advance notice of date, hour and place shall be provided by the Contractor per Subparagraph 7.7.2 above. Application of Paragraph 13.2 of this Agreement is stayed pending reports on the counter-tests, provided that such reports are delivered within seven (7) days of completion of test.
- 7.7.13 If counter-tests demonstrate compliance with Contract requirements, and the Contractor has met the time requirements of Subparagraph 7.7.12 above, the County shall reimburse the Contractor for all definable costs of the counter-tests, as determined by the Construction Manager; and a Change Order shall be issued covering such costs and, if warranted, a reasonable extension of the Contract Time as determined by the Construction Manager. Otherwise, all responsibility for the costs and delays occasioned by the counter-tests shall remain with the Contractor.
- 7.7.14 If the counter-tests indicate defective work or failure to conform to the Contract Documents, the Architect or the Construction Manager may reject the work, after which Paragraph 13.2 of this Agreement applies.
- 7.7.15 If the Contractor objects to the use of a test method or criterion which has not been stipulated in the Contract Documents, it shall so notify the Construction Manager at least seven (7) days prior to the start of the testing.
- 7.7.16 The Contractor shall provide the Construction Manager with a copy of all inspection and test reports. Reports indicating compliant results shall be distributed on white bond paper and reports indicating non-compliance for a specific test shall be distributed on yellow bond paper.
- 7.8 INTEREST
- 7.8.1 PROMPT PAY PROVISION: The COUNTY shall make monthly partial payments to the CONSULTANT in accordance with the provisions of the Contract Documents. COUNTY and CONSULTANT, their agents and assigns, agree that in the event any contract provision pertaining to the time of payment, conditions precedent to payment, the rate of payment, and any rates of interest, differs from any provision of the Georgia Prompt Pay Act, such provision of the Prompt Pay Act is hereby waived and said Contract provision shall control.

7.9 WORK PERFORMANCE & CONDUCT

7.9.1 In accordance with O.C.G.A. 36-10-2.1, the Contractor's performance under this Agreement shall be documented with the Fulton County Purchasing Department and may be used by the County in consideration for future contracts.

7.9.2 The Contractor shall be responsible for maintaining satisfactory standards of employees' competency, conduct, courtesy, appearance, honesty, and integrity, and shall be responsible for taking such disciplinary action with respect to any employee, as may be necessary.

7.9.3 The County may request the Contractor to immediately remove from this assignment and/or dismiss any employee found unfit to perform duties due to one or more of the following reasons:

7.9.3.1 Neglect of duty.

7.9.3.2 Disorderly conduct, use of abusive or offensive language, quarreling, intimidation by words or actions or fighting.

7.9.3.3 Theft, vandalism, immoral conduct or any other criminal action.

7.9.3.4 Selling, consuming, possessing, or being under the influence of intoxicants, including alcohol, or illegal substances while on assignment for the County.

7.9.3.5 Other reasons that adversely affect the performance of the work.

7.10 SEVERABILITY

7.10.1 If any provision of this Agreement is held to be unenforceable by for any reason, the unenforceability thereof shall not affect the remainder of the Agreement, which shall remain in full force and effect, and enforceable in accordance with its terms. If any part of this Agreement is found to be in conflict with applicable laws, such part shall be inoperative, null and void insofar as it is in conflict with said laws, but the remainder of this Agreement shall be in full force and effect.

7.11 FORCE MAJEURE

7.11.1 Neither the County nor the Contractor shall be deemed in violation of this Agreement if either is prevented from performing its obligations hereunder for any reason beyond its control, including, but not limited to, acts of God, civil or military authority, act of public enemy, accidents, fires, explosions, earthquakes, floods or catastrophic failures of public transportation, provided however, that nothing herein shall relieve or be construed to relieve the Contractor from performing its obligations hereunder in the event of riots, rebellions, or legal strikes.

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## ARTICLE 8

### TIME

#### 8.1 DEFINITIONS

8.1.1 Unless otherwise provided, the Contact Time is the period of time allotted in the Contract Documents from issuance of a Notice to Proceed to the Contractor's Substantial Completion of the Work as defined below, including authorized adjustments thereto.

8.1.2 The date of award of the Contract is the date specified in the Notice of Award. This is the date which should be used on the certificate of insurance, performance and payment bonds, and any other information required prior to the issuance of a Notice to Proceed by the County. This date shall also be the date entered in the Contract Documents on page 1 of this Agreement. In the event of a conflict between these dates, the date indicated in this Agreement shall prevail.

8.1.3 The date of commencement of the Work is the date established in the Notice to Proceed.

8.1.4 The Date of Substantial Completion of the Work or designated portion thereof is the date certified by the Architect and the Construction Manager when construction is sufficiently complete, in accordance with the Contract Documents, so that the County or the County's separate contractors can occupy or utilize the Work or a designated portion thereof for the use for which it is intended. A Certificate of Occupancy is required to achieve Substantial Completion, as well as submission of complete and final project record documents to the Construction Manager for review, including record drawings, operation and maintenance manuals, warranties and other submittal requirements detailed in the General Requirements.

8.1.5 The Date of Final Completion of the Work is the date certified by the Architect and the Construction Manager when all construction is fully complete, including rectification of all punch list items, and when all record documentation and other closeout items required by the Contract Documents have been reviewed and found acceptable by the Construction Manager.

8.1.6 The term "day" as used in the Contract Documents shall mean "calendar day" unless specifically designated otherwise.

8.1.7 The term "milestone" shall mean a date at which an intermediate portion of the Work must be completed, as indicated in the Contract Documents.

#### 8.2 CONTRACT TIME LIMITS

8.2.1 **Milestones**: The Contractor shall begin the Work on the date specified in the Notice to Proceed. The Contractor shall carry the Work forward expeditiously with adequate forces and achieve the following interim milestones:

8.2.2 Substantial Completion of the Work: The Contractor shall carry the Work forward expeditiously with adequate forces and shall achieve Substantial Completion of the Work within **three hundred thirty-five (335) calendar days** after receipt of the Notice to Proceed, or this Contract shall be subject to termination by the County in addition to the imposition of damages as set forth herein.

8.2.3 Final Completion of the Work: The Work shall be fully completed thirty (30) calendar days thereafter or **three hundred sixty-five (365) calendar days** after receipt of the Notice to Proceed.

### 8.3 DAMAGES FOR LATE COMPLETION

8.3.1 All time limits stated in the Contract Documents are of the essence of the Contract. The Contractor confirms that the Contract Time is a reasonable period for performing the Work. It is understood and agreed by the Contractor that failure to meet the time limits shall result in damages to the County for which the Contractor shall be liable, including, but not limited to the County's:

8.3.1.1 Costs for extended professional services (program management, construction management, Architect's construction administration, etc.),

8.3.1.2 *not used*

8.3.1.3 Other costs and expenses incurred by the County for failure by the Contractor to meet the time limits.

8.3.2 Pursuant to Subparagraph 8.3.1 above, the Contractor and the Contractor's surety shall be liable for and shall pay the County the sum herein stipulated as liquidated damages for each calendar day of delay beyond the Substantial Completion Date required by Subparagraph 8.2.2 of this Owner-Contractor Agreement, adjusted for any schedule extensions which may be granted by the County by Change Order, until the Work is considered substantially complete. This sum represents an amount which is estimated to be incurred by the County, for the damages described in Subparagraph 8.3.1 above, as a direct result of the Contractor's delay, should such delay occur. This amount shall be three hundred fifty dollars (**\$350.00**) per calendar day.

8.3.3 The sums which may be paid by the Contractor for liquidated damages are strictly designed to cover the estimated losses to the County as a direct result of possible Contractor delays on the project. The assessment of liquidated damages in no way limits the amount of damages which may be recoverable by the County for the completion of unfinished or defective work performed by the Contractor.

### 8.4 DELAYS AND EXTENSIONS OF TIME

8.4.1 It is hereby understood and mutually agreed, by and between the Contractor and the County, that the date of beginning and the time for completion of the Work, including any activities to be done hereunder are ESSENTIAL CONDITIONS of this Contract; and it is further mutually understood and agreed that the Contract Time specified in this Contract shall commence on the date specified in the Notice to Proceed. The County and separate contractors are entitled to rely upon such dates which by its acceptance of this Contract, have been agreed upon by the Contractor.

8.4.2 The Contractor agrees that said Work shall be executed regularly, diligently and uninterruptedly at such rate of progress as shall insure full completion thereof within the time specified. It is expressly understood and agreed that the Contractor has considered all contingencies and factors affecting its ability to perform all the Work within the time specified, including among others, delays caused by bad weather and other possible delays caused by the industrial conditions prevailing in this locality, and after consideration of these factors, it has made an allowance for such factors before agreeing to the completion date specified in the Contract Documents, and does, further, agree that all things considered, such completion date is a reasonable time for completion of all Work to be performed hereunder, without the need for any extension of time or any other reasons than those specified below.

8.4.3 Completion time shall not be extended for normal bad weather. The following bad weather days per month shall be anticipated and included in the contractual time period given for project completion. The Contractor's request for additional time shall only be granted for days beyond

those listed below for which work was actually significantly impeded or precluded by bad weather. The burden of proof and documentation for such request for additional time beyond the days shown below shall rest solely with the Contractor. Documentation must clearly show the additional weather days are historically unique to the area. No change in Contract Sum will be granted by the County for adjustments to the Contract Time due to weather.

January	10 days
February	10 days
March	7 days
April	6 days
May	4 days
June	3 days

July	4 days
August	2 days
September	2 days
October	2 days
November	5 days
December	9 days

- 8.4.3.1 Requests for time extensions for delays due to severe weather shall be considered only after the building is enclosed.
- 8.4.3.2 Only those days lost in excess of the cumulative allowable number of bad weather calendar days, according to the schedule above, will be considered.
- 8.4.3.3 Time extensions for time losses due to severe weather conditions will not be considered in fractions of less than one-half (1/2) day.
- 8.4.4 It is further agreed that time is of the essence of each and every portion of this Contract wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any of the Work, the new time limit fixed by such extension shall be of the essence of this Contract.
- 8.4.5 The County, Architect, and Construction Manager shall not be responsible or liable to the Contractor for compensation, damages, expenses or any other costs as a result of, or due to any delays, impact and/or acceleration.
- 8.4.6 In no event shall delay damages be due resulting from the Contractor's submittal of a schedule indicating early completion of the Work, regardless of whether such schedule is acknowledged or approved by the Construction Manager, which is then followed by the Contractor's subsequent completion of the Work on a later date but still within the Contract Time, regardless of cause.
- 8.4.7 If the Contractor is delayed at any time in the progress of the Work by any of the following causes, or by any other cause which the Construction Manager determines may cause the delay, then the Contract Time may be extended, without cost as a no cost change order, for such time as the Construction Manager may determine when the delay in completion of work is due:
  - 8.4.7.1 to any preference, priority or allocation order duly issued by Government or the County.
  - 8.4.7.2 to unforeseeable cause beyond the control and without the fault or negligence of the Contractor, restricted to acts of God, or of the public enemy, acts of a separate contractor in the performance of the Contract with the County, fire, floods, epidemics, quarantine restrictions, strikes or labor disputes, freight embargoes or other unusual delays in transportation, and unusually severe weather in excess of normal weather losses allowed in Subparagraph 8.4.3 above.
  - 8.4.7.3 to any delays of subcontractors or suppliers occasioned by any of the causes specified except that delays occasioned by the failure of the Contractor, subcontractors, or suppliers to issue purchase orders with sufficient lead time to assure delivery by the

date needed, and production line schedule delays of the product manufacturer, shall not be considered grounds for a time extension.

- 8.4.8 Provided further, that the Contractor shall, within ten (10) days from the beginning of such delay notify the County through the Construction Manager as agent for the County, in writing, of the causes of the delay for each delay caused by reasons other than the weather, and provide whatever supporting or substantiating information required by the Construction Manager. The Construction Manager shall, where possible, ascertain the facts and extent of the delay or delays for time extension, other than those caused by weather, filed by the Contractor and report his findings and recommendations to the County no less frequently than monthly. If the Construction Manager recommends a time extension, it shall be documented in a no cost change order. In cases where a time extension is filed, except those that are of a continuing nature and extend beyond the normal monthly reporting period stated herein, the Construction Manager shall ascertain the facts and render its recommendation within thirty (30) days of the receipt of the final data relating to the time extension.
- 8.4.9 If no agreement is made stating the dates upon which interpretations as provided in Subparagraph 2.3.8 of this Agreement shall be furnished, then no time extension for delay shall be allowed on account of failure to furnish such interpretations until fifteen (15) days after written request is made for them, and not then unless need for such time extension is clearly demonstrated to the Construction Manager, and that such request for interpretation shall have been made prior to thirty (30) days having elapsed since the receipt of the Notice to Proceed.
- 8.4.10 In no event shall Contractor be entitled to other general condition costs, home office overhead, lost profits, loss of use of capital or any other type of consequential damages.

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ARTICLE 9

**PAYMENTS AND COMPLETION**

Note: this form to be filled out after award of contract

9.1 CONTRACT SUM

9.1.1 The County shall pay the Contractor for the performance of the Work, subject to additions and deductions by Change Order as provided in the Contract Documents, a Contract Sum not to exceed the following amount:

\$ \_\_\_\_\_  
(in numbers)

\_\_\_\_\_  
(in words)

The Contract Sum is determined as follows:

Base Bid Amount \$ \_\_\_\_\_

Bid Alternate No. \$ \_\_\_\_\_

Bid Alternate No. \$ \_\_\_\_\_

TOTAL BASE CONTRACT AMOUNT. \$ \_\_\_\_\_

9.1.1.1 UNIT PRICES

The following unit prices offered by the Contractor in its bid are incorporated into the Contract. These unit prices shall be used to determine equitable adjustments to the Contract Sum in connection with changes or additional work performed under the Contract. Detailed descriptions of these unit prices are found in Section 01 027 of the Project Manual.

Unit Price No. \$ \_\_\_\_\_

Unit Price No. \$ \_\_\_\_\_

Unit Price No. \$ \_\_\_\_\_

9.1.2 The Contract Sum as stated herein, including authorized adjustments thereto by Change Order as provided in the Contract Documents, is the total amount payable by the County to the Contractor for the performance of the Work under the Contract Documents.

9.2 SCHEDULE OF VALUES

9.2.1 Before the first Application for Payment, the Contractor shall submit to the Construction Manager a Schedule of Values allocated to the various portions of the Work (including costs for design and other professional services), prepared in such form and supported by such data to substantiate its accuracy as the Architect and the Construction Manager may require, and as is further defined in the General Requirements. This schedule, as approved by the Architect and the Construction Manager, shall be used as the basis for the Contractor's Applications for Payment.

9.3 PAYMENTS

- 9.3.1 After the Construction Manager has issued a Certificate for Payment as described in Paragraph 9.5 below, the County shall, subject to the provisions of this Article and the General Requirements, pay the Contractor ninety (90) percent of the portion of the Contract Sum properly allocable to labor, materials, and equipment incorporated in the Work, suitably stored at the site or at some other location agreed upon in writing by the parties as of the date the Application for Payment is submitted to the Construction Manager, less the aggregate of previous payments in each case.
- 9.3.2 No certification of an Application for Payment by the Construction Manager, any payment, or any partial or entire use or occupancy of the Project by the County, shall constitute an acceptance of any Work not in accordance with the Contract Documents.
- 9.3.3 Neither the County, Architect, or Construction Manager shall have any obligation to pay or to see to the payment of any monies to any subcontractor except as may otherwise be required by law.
- 9.3.4 The Contractor hereto expressly agrees that the payment provisions within this Article 9 shall supersede the rates of interest, payment periods, and contract and subcontract terms provide for under the Georgia Prompt Pay Act, O.C.G.A. 13-11-1 et seq., pursuant to 13-11-7(b), and the rates of interest, payment periods, and contract and subcontract terms provided for under the Prompt Pay Act shall have no application to this Contract.
- 9.3.5 The Contractor shall promptly pay each subcontractor upon receipt of payment from the County, out of the amount paid to the Contractor on account of such subcontractor's Work, the amount to which said subcontractor is entitled, reflecting the percentage actually retained, if any, from payments to the Contractor on account of such subcontractor's Work. The Contractor shall, by an appropriate agreement with each subcontractor, require each subcontractor to make payments to their sub-subcontractors in a similar manner.
- 9.3.6 The County reserves the right to inquire of the Contractor's subcontractors and suppliers directly or indirectly, to determine the current status of indebtedness. Should undisputed amounts be owed to any such subcontractors or suppliers, and upon seven (7) days written notice to the Contractor, the County may make checks payable jointly to the Contractor and the subcontractor or supplier, or directly to the subcontractor or supplier for the account of the Contractor in such amount. Payment to the Contractor or for its account shall not be deemed to be an admission or approval by the County of the sufficiency of the Work covered by such payment.
- 9.3.7 The County reserves the right to require the Contractor to designate on each check for payment exceeding four hundred dollars (\$400.00) to material suppliers, subcontractors or others that such payment is on account of the Work covered under this Contract.

9.4 APPLICATIONS FOR PAYMENT

- 9.4.1 Applications for Payment shall be submitted no more frequently than monthly to the Construction Manager. Each Application for Payment shall be supported by such data substantiating the Contractor's right to payment as the Construction Manager or the County may require, and reflecting retainage, if any, as provided for in the Contract Documents. The Construction Manager will forward a copy to the Architect for its recommendations. Upon receipt of recommendations from the Architect, the Construction Manager, after its own review, will determine the amount to be recommended for payment by the County, and shall certify its recommendation and forward a Certificate for Payment to the County for review and processing. Further provisions are contained in the General Requirements. Reference Section 01 025 of the General Requirements for procedural details.

- 9.4.2 The Contractor warrants that title to all Work, materials and equipment covered by an Application for Payment will pass to the County either by incorporation in the construction or upon receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, claims, security interests or encumbrances, hereinafter referred to in the Contract as "liens"; and that no Work, materials or equipment covered by an Application for Payment will have been acquired by the Contractor, or by any other person performing Work at the site or furnishing materials and equipment for the Project, subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor on such other person.
- 9.4.3 Unless otherwise provided in the Contract Documents, payments will be made on account of materials or equipment not incorporated in the Work but delivered and suitably stored at the Project site, and, if approved in advance by the County, payments may similarly be made for materials or equipment suitably stored at some other location agreed upon in writing. Payments for materials or equipment stored on or off the Project site shall be conditioned upon submission by the Contractor of bills of sale or other such procedures satisfactory to the County to establish the County's title to such materials or equipment or otherwise protect the County's interest, including applicable insurance and transportation to the Project site for those materials and equipment stored off of the Project site. Reference Section 01 025 of the General Requirements for detailed instructions.
- 9.4.4 Fulton County requires that all contractors submit Interim Waiver and Release Upon Payment and an Unconditional Waiver and Release Upon Final Payment when submitting applications for payment. These forms are to be attached applications as exhibits.
- 9.4.5 The Prime Contractor must certify in writing and shall document on the Department of Contract Compliance Exhibit G Form (Prime Contractor's Subcontractor Utilization Report), that all Subcontractors and Suppliers have been promptly paid for work and materials and previous progress payments received (less any retainage by the Prime Contractor prior to receipt of any further progress payments). In the event the Prime Contractor is unable to pay Subcontractors and Suppliers until the Prime Contractor has received a progress payment from Fulton County, the Prime Contractor shall pay all Subcontractors or Suppliers funds due from said progress payments within 48 hours of receipt of payment from Fulton County.

9.5 CERTIFICATES FOR PAYMENT

- 9.5.1 The Construction Manager will with reasonable promptness upon receipt of the Contractor's Application for Payment, and with recommendations from the Architect, review the Application for Payment and either issue a Certificate for Payment to the County with a copy for distribution to the Contractor for such amounts as the Construction Manager determines are properly due, or notify the Contractor in writing of the reasons for withholding a Certificate for Payment as provided in Subparagraph 9.6.1.
- 9.5.2 By issuing a Certificate for Payment, it shall not thereby be deemed to be represented that either the Architect or the Construction Manager has made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, has reviewed the construction means, methods, techniques, sequences or procedures, or has made any examination to ascertain how or for what purpose the Contractor has used any monies previously paid on account of the Contract Sum.

9.6 PAYMENTS WITHHELD

- 9.6.1 The Construction Manager may decline to certify payment, and may withhold a certification for payment in whole or in part to the extent necessary to reasonably protect the County, if in the Construction Manager's opinion, the Construction Manager is unable to make representations as to the accuracy of the Application for Payment to reflect the current status of the Work. If the

Contractor and the Construction Manager cannot agree on a revised amount, the Construction Manager shall promptly issue a Certificate for Payment for the amount for which the Construction Manager is able to make such representations. The Construction Manager may also decline to certify payment or, because of subsequently discovered evidence or subsequent observations, the Construction Manager may nullify the whole or any part of any Certificate for Payment previously issued to such extent as may be necessary, in the Construction Manager's opinion, to protect the County from loss for several reasons including, but not limited to: 9.6.1.1 defective Work not remedied.

9.6.1.2 third party claims filed or reasonable evidence indicating probable filing of such claims.

9.6.1.3 failure of the Contractor to make payments properly to subcontractors or subconsultants, or for labor, materials or equipment.

9.6.1.4 reasonable belief that the Work cannot be completed for the unpaid balance of the Contract Sum for the line items under discussion.

9.6.1.5 damage to the County or another contractor.

9.6.1.6 reasonable evidence that the Work will not be completed within the Contract Time; or

9.6.1.7 persistent or repeated failure to carry out the Work in accordance with the Contract Documents or written direction provided by the Construction Manager.

9.6.2 When the grounds above are removed, payment shall be made for amounts withheld.

## 9.7 SUBSTANTIAL COMPLETION

9.7.1 When the Contractor considers that the Work, or a designated portion thereof which is acceptable to the County, is substantially complete, the Contractor shall prepare for the Construction Manager a list of items to be completed or corrected. The Contractor shall proceed to complete and correct items on the list. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

9.7.2 Upon receipt of the Contractor's list of items to be completed or corrected, the Architect, in conjunction with the County and the Construction Manager, shall make an inspection to determine that the Work or designated portion thereof is substantially complete. When the Architect, on the basis of inspection and consultation with the County, and the Construction Manager determines that the Work or designated portion thereof is substantially complete, the Construction Manager will then prepare a Certificate of Substantial Completion of the Work, on the latest version of *AIA Document G704/CMA, Certificate of Substantial Completion – Construction Manager-Advisor Edition*, which shall establish the Date of Substantial Completion of the Work, shall state the responsibilities of the County and the Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall complete the items listed therein as incomplete or requiring correction. The Certificate of Substantial Completion shall be submitted to the County, the Architect, the Construction Manager, and the Contractor for their written acceptance of the responsibilities assigned to them in such Certificate.

9.7.3 At no time shall a certification of Substantial Completion be considered for issuance unless a Certificate of Occupancy has been approved and received.

9.7.4 Prior to and as a condition of the Construction Manager issuing a Certificate of Substantial Completion, all Project Closeout Documents including, but not limited to project record documents

(as-builts), operation and maintenance manuals, warranties and other documents, shall have been submitted to the Construction Manager for review and approval.

9.7.5 Warranties required by the Contract Documents shall commence on the Date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion of the Work or designated portion thereof. Warranties for Work that is not accepted by the County shall commence on a date when the Work is finally accepted by the County.

9.7.6 Reference Section 01 700 of the General Requirements for additional procedural details regarding Substantial Completion.

## 9.8 FINAL COMPLETION AND FINAL PAYMENT

9.8.1 Following issuance of the approved Certificate of Substantial Completion of the Work or designated portion thereof, and the Contractor's final completion of the Work, the Contractor shall forward to the Construction Manager a written notice that the Work is ready for final inspection and acceptance, and shall also forward to the Construction Manager a final Application for Payment. The Architect, in conjunction with the County and the Construction Manager shall make such inspections and, when the Architect finds the Work acceptable and fully performed, the Construction Manager shall certify the final Application for Payment, which will approve the final payment due the Contractor. This approval shall constitute a representation that, to the best of the Construction Manager's knowledge, information and belief, and on the basis of observations and inspections, the Work has been completed in accordance with the Terms and Conditions of the Contract Documents and that the entire balance found to be due the Contractor, and noted in said certified final Application for Payment, is due and payable.

9.8.2 Final payment, including all remaining retainage, shall not become due until the Contractor submits to the Construction Manager,

9.8.2.1 A notarized affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the County or the County's property might in any way be responsible, have been paid or otherwise satisfied (*AIA Document G706, Contractor's Affidavit of Payment of Debts and Claims*, latest version),

9.8.2.2 Consent of Surety to Final Payment (*AIA Document G707*, latest version), and

9.8.2.3 Other data establishing payment or satisfaction of all such obligations, including receipts, releases and waivers of liens arising out of the Contract, to the extent and in such form as may be designated by the County (including, but not limited to, *AIA Document G706A, Contractor's Affidavit of Release of Liens*, latest version).

If any subcontractor or subconsultant refuses to furnish a release or waiver required by the County, the Contractor may furnish a bond satisfactory to the County to indemnify the County against any such lien. If any such lien remains unsatisfied after all payments are made, the Contractor shall refund to the County all monies that the latter may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

9.8.2.4 All final Project Closeout Documents including, but not limited to project record documents (as-builts), operation and maintenance manuals, warranty manuals and other documents, shall have been finalized and re-submitted to the County for review and final approval and acceptance.

Reference Section 01 700 of the General Requirements for additional procedural details regarding Final Completion.

- 9.8.3 The making of final payment shall, after the Date of Substantial Completion, constitute a waiver of all claims by the County except those arising from:
- 9.8.3.1 unsettled liens;
  - 9.8.3.2 faulty or defective Work appearing after Substantial Completion of the Work;
  - 9.8.3.3 failure of the Work to comply with the requirements of the Contract Documents;
  - 9.8.3.4 terms of any special warranties required by the Contract Documents.
- 9.8.4 The acceptance of final payment shall, after the Date of Substantial Completion of the Work, constitute a waiver by the Contractor of all claims except those previously made in writing and identified by the Contractor as unsettled at the time of the final Application for Payment.
- 9.8.5 In the event the Contractor timely disputes the amount of final payment, the amount due the Contractor shall be deemed by the Contractor and the County to be an unliquidated sum, and no interest shall accrue or be payable on the sum finally determined to be due to the Contractor for any period prior to final determination of such sum, whether such determination be by agreement of the Contractor and the County or by final judgment of the proper court in the event of litigation between the parties. The Contractor specifically waives and renounces any and all rights it may have under O.C.G.A. 13-6-13 and agrees that in the event suit is brought by the Contractor against the County for any sum claimed by the Contractor under the Contract or for any extra or additional Work, no interest shall be awarded on any sum found to be due from the County to the Contractor in the final judgment entered in such suit. All final judgments shall draw interest at the legal rate, as specified by law.
- 9.8.6 All provisions of this Agreement, including without limitation those establishing obligations and procedures, shall remain in full force and effect notwithstanding the making or acceptance of final payment prior to the Date of Substantial Completion of the Work.

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**ARTICLE 10**

**SAFETY**

10.1 OWNER-CONTRACTOR SAFETY, HEALTH AND LOSS PREVENTION PROGRAM

10.1.1 The Contractor shall be responsible for designing and implementing a comprehensive project-specific safety, health and loss prevention process and/or program and employee substance abuse program for this project. All subcontractors must either implement their own program that meets these requirements or follow the Contractor's safety, health and loss prevention process and/or employee substance abuse program.

10.1.2 Safety, health and loss prevention process and/or employee substance abuse program must meet or exceed all governmental regulations (OSHA, EPA, DOT, State, local), comply and other specific Fulton County or Owner Controlled Insurance Program (OCIP) requirements, and with any other safety, health and loss prevention requirements detailed in the contract documents including the requirements of the Contractor Safety and Health Management Process which is attached hereto and incorporated herein.

10.1.3 Within ten (10) business days of receipt of the Notice of Award (NOA), the Contractor shall submit in writing to the County's designated Representative, the Contractor's written Safety, Health and Loss Prevention Process and/or Program and Employee Substance Abuse Program and those of Sub-Contractors that meet or exceed the requirements referenced in the contract documents. Included in this submittal will be the name and qualifications of the site safety representative.

Prior to issuing the Notice to Proceed (NTP), a meeting will be held with the Contractor and all Sub-Contractors to review the safety, health and loss prevention process and/or program requirements, submittals to be provided by the Contractor, OCIP requirements and procedures, and the OCIP accident prevention process.

These program submittals must be reviewed and accepted by the County's designated Representative as meeting or exceeding safety, health, and loss prevention process and/or program requirements. A Notice To Proceed (NTP) with the work may not be issued until these submittals have been accepted.

10.2 DESIGNATION OF SAFETY REPRESENTATIVE

10.2.1 The Contractor will designate an employee by (name, phone number, pager number) as Site Safety Representative. This employee will have sufficient training and knowledge of safety and health principles, regulations, and procedures to report to the Contractor's Project Manager and/or Superintendent. Sub-Contractors must also designate a similar employee responsible for safety and health. The Sub-Contractor's safety designee will coordinate safety activities with the general contractor's safety designee.

For projects with significant risk or hazard potential or for any project for which the Contractor and its Sub-Contractors of any tier have 50 total employees or greater on site, Contractor must designate a qualified employee to be the full time Site Safety Representative. This person should address safety, health and loss prevention activities for the complete project including Sub-Contractors.

10.3 FULTON COUNTY'S SAFETY, HEALTH, AND LOSS PREVENTION PROCESS GUIDELINES & REQUIREMENTS

10.3.1 The County and its agents reserve the right, but assume no duty, to establish and enforce safety, health, and loss prevention guidelines and to make the appropriate changes in the guidelines, for the protection of persons and property and to review the efficiency of all protective measures taken by the Contractor. The Contractor shall comply with all safety, health, and loss prevention process guidelines and requirements and changes made by the County or its agent(s). The issuance of any such guidelines or changes by the County or its agent(s) shall not relieve the Contractor of its duties and responsibilities under this Agreement, and the County or its agent(s) shall not thereby assume, nor be deemed to have assumed, any such duties or responsibilities of the Contractor.

10.4 COMPLIANCE OF WORK, EQUIPMENT, AND PROCEDURES WITH ALL APPLICABLE LAWS & REGULATIONS

10.4.1 All Work, whether performed by the Contractor or its Sub-Contractors of any tier, or anyone directly or indirectly employed by any of them, and all equipment, appliances, machinery, materials, tools and like items incorporated or used in the Work, shall be in compliance with and conform to:

(a) all applicable laws, ordinances, rules, regulations and orders of any public, quasi-public or other governmental authority relating to the safety of persons and their protection against injury, specifically including, but in no event limited to, the Federal Occupational Safety and Health Act of 1970, as amended, and all rules and regulations now or hereafter in effect pursuant to said Act.

(b) all rules, regulations, and requirements of the County or its agent(s) and its insurance carriers relating there to. In the event of a conflict or differing requirements the more stringent shall govern.

10.5 PROTECTION OF THE WORK

10.5.1 The Contractor shall, throughout the performance of the Work, maintain adequate and continuous protection of all Work and temporary facilities against loss or damage from whatever cause, shall protect the property of the County and third parties from loss or damage from whatever cause arising out of the performance of the Work, and shall comply with the requirements of the County or its agent(s) and its insurance carriers, and with all applicable laws, codes, rules and

regulations, (as same may be amended) with respect to the prevention of loss or damage to property as a result of fire or other hazards.

10.5.2 The County or its agent(s) may, but shall not be required to, make periodic inspections of the Project work area. In such event, however, the Contractor shall not be relieved of its aforesaid responsibilities and the County or its agent(s) shall not assume, nor shall it be deemed to have assumed, any responsibility otherwise imposed upon the assurance of Contractor by this Agreement.

## 10.6 SAFETY EQUIPMENT

10.6.1 The Contractor shall provide to each worker on the Project work area the proper safety equipment for the duties being performed by that worker and will not permit any worker on the Project work area who fails or refuses to use the same. The County or its agent shall have the right, but not the obligation, to order the removal of a worker from the Project work site for his/her failure to comply with safe practices or substance abuse policies, and the Contractor shall promptly comply with the Safety Program or Substance Abuse Program and all such orders.

## 10.7 EMERGENCIES

10.7.1 In any emergency affecting the safety of persons or property, or in the event of a claimed violation of any federal or state safety or health law or regulation, arising out of or in any way connected with the Work or its performance, the Contractor shall act immediately to prevent threatened damage, injury or loss and to remedy said violation. Failing such action the County or its agent(s) may immediately take whatever steps it deems necessary including, but not limited to, suspending the Work as provided in this Agreement.

10.7.2 The County or its agent(s) may offset any and all costs or expenses of whatever nature, including attorneys' fees, paid or incurred by the County or its agent(s) (whether such fees are for in-house counsel or counsel retained by the County or its agent), in taking the steps authorized by Section 10.7.1 above against any sums then or thereafter due to the Contractor. The Contractor shall defend, indemnify and hold the County, its officers, agents, employees and the O.C.I.P. Administrator harmless against any and all costs or expenses pursuant to Section 10.7.1, by whomsoever incurred. If the Contractor shall be entitled to any additional compensation or extension of time change order on account of emergency work not due to the fault or neglect of the Contractor or its Sub-Contractors, such additional compensation or extension of time shall be determined in accordance with Section 8 and Section 12 of this Agreement.

## 10.8 SUSPENSION OF THE WORK

Should, in the judgment of the County or its agent(s), the Contractor or any Sub-Contractor fail to provide a safe and healthy work place or fail to follow the safety requirements defined in the contract documents and approvals, the County or its agent shall have the right, but not the obligation, to suspend work in the unsafe areas until deficiencies are corrected. All costs of any

nature (including, without limitation, overtime pay, liquidated damages or other costs arising out of delays) resulting from the suspension, by whomsoever incurred, shall be borne by the Contractor.

Should the Contractor or any Sub-Contractor fail to provide a safe and healthy work place or fail to follow the safety requirements defined in the contract documents and approvals after being formally notified in writing by the County or its agents of such non-compliance, the contract may be terminated following the termination provision of the contract.

10.9 CONTRACTOR'S INDEMNITY OF THE COUNTY FOR CONTRACTOR'S NON-COMPLIANCE WITH SAFETY PROGRAM

10.9.1 The Contractor recognizes that it has sole responsibility to assure its Safety Program is implemented and to assure its construction services are safely provided. The Contractor shall indemnify, defend and hold the County and its agents harmless, from and against any and all liability (whether public or private), penalties (contractual or otherwise), losses, damages, costs, attorneys' fees, expenses, causes of action, claims or judgments resulting, either in whole or in part, from any failure of the Contractor, its Sub-Contractors of any tier or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, to comply with the safety requirements of the contract. The Contractor shall not be relieved of its responsibilities under the safety requirements of the Contract should the County or its agent(s) act or fail to act pursuant to its rights hereunder. The County, its agents, and the O.C.I.P. Administrator shall not assume, nor be deemed to have assumed, any responsibilities otherwise imposed upon the Contractor by this Agreement, by virtue of providing the Safety Program Guidelines.

10.9.2 The Contractor shall not raise as a defense to its obligation to indemnify under this Subparagraph 10.9 any failure of those indemnified hereunder to assure Contractor operates safely, it being understood and agreed that no such failure shall relieve the Contractor from its obligation to assure safe operations or from its obligation to so indemnify. The Contractor also hereby waives any rights it may have to seek contribution, either directly or indirectly, from those indemnified hereunder.

10.9.3 In any and all claims against those indemnified hereunder by any employee of the Contractor, any Sub-Contractor of any tier or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Subparagraph 10.9 shall not be limited in any way as to the amount or type of damages, compensation or benefits payable by or for the Contractor or any Sub-Contractor of any tier under any workers' compensation act, disability benefit or other employee benefit acts.

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## ARTICLE 11

### INSURANCE

#### 11.1 OWNER-CONTROLLED INSURANCE PROGRAM

##### 11.1.1 INTRODUCTION

Fulton County has implemented an Owner-Controlled Insurance Program ("OCIP") that covers this Project. Certain relevant provisions of the County's OCIP are outlined below. This OCIP does not affect Fulton County Government's statutory immunity. Under the OCIP, the County **shall furnish certain portions** of the Workers' Compensation, General Liability, and Builder's Risk insurance associated with the County's construction projects. Insurance furnished under the OCIP covers the County, the Contractor and its Sub-Contractors of all tiers (with some exceptions, as described below), and other persons or interests as the County may designate in connection with the performance of the Work. As detailed below, the **Contractor** still provides certain other portions of insurance coverage not included in the OCIP.

##### 11.1.2 DEFINITIONS SPECIFIC TO THIS ARTICLE 11

11.1.2.1 "Owner-Controlled Insurance Program" (OCIP) means an insurance delivery method that assures the Contractor, and its Sub-Contractors of all tiers, and other persons or interests as the County may designate in connection with the performance of the work are insured for certain prescribed Statutory Workers' Compensation, Employers Liability and Commercial General Liability, and such other coverages as the County may in writing specifically add or delete for the Project.

11.1.2.2 "OCIP Administrator" means the administrator retained by the County to implement and administer the OCIP. The OCIP Administrator is Resurgens Risk Management/Willis.

11.1.2.3 The term "enrolled" applies to the entities covered under the OCIP. The Contractor is enrolled in the OCIP. The Contractor's Sub-Contractors of all tiers shall be enrolled in the OCIP, provided in general that they are performing construction work at the Project site and that the work being performed is not temporary to the project and is an elemental component of the completed project. The Contractor shall assure that all enrolled Sub-Contractors of all tiers satisfy all safety program obligations, claim management and applicable insurance requirements relative to the OCIP. The Contractor understands that all Contractor obligations set forth in the County's OCIP, whether performed directly by the Contractor obligations set forth in the County's OCIP, whether performed directly by the Contractor or indirectly by its enrolled Sub-Contractors, are the responsibility of the Contractor. Whenever this Agreement establishes obligations for Contractor with respect to the OCIP, it shall also be deemed to establish obligations for enrolled Sub-Contractors. Certain exceptions apply to enrolled entities, as described below.

11.1.2.4 The term "non-enrolled" applies to the entities not covered under the OCIP. In general vendors, suppliers, fabricators, material dealers, drivers and others who merely transport, pick up, deliver or carry materials, personnel, parts or equipment or any other items or persons to or from the Project site shall be considered non-enrolled entities for the purpose of insurance coverage

under the County's OCIP. This non-enrolled OCIP Contractor status also applies to those contractors whose only work is temporary to the site and are not involved in any project construction that is part of the work on the finished project. The Contractor shall assure that all non-enrolled Sub-Contractors of all tiers satisfy all safety program obligations, claim management and applicable insurance requirements relative to the OCIP.

11.1.2.5 "Agent" means the Fulton County's designated Representative, as defined within this Agreement. For purposes of the OCIP, the County's designated Representative shall serve as the County's primary contact for communication with the Contractor related to the OCIP.

### 11.1.3 INSURANCE OBLIGATIONS OF THE COUNTY AND CONTRACTOR

#### 11.1.3.1 INSURANCE PROVIDED BY THE COUNTY UNDER ITS OCIP.

- (a) The County shall secure and thereafter maintain, except as otherwise provided herein, the insurance coverages described in Subparagraphs 11.1.3.2, 11.1.3.3, and 11.1.3.4 below, covering as insured parties the County, the Contractor and its Sub-Contractors of all tiers (except as detailed below), and such other persons or interests as the County may designate in connection with the performance of the Work, and with limits not less than those specified for each coverage ("OCIP insurance coverage").
- (b) No insurance coverage provided by the County's OCIP shall extend to the activities or products of the following:
  - (i) Any person and/or organization that fabricates and/or manufactures products, materials, and/or supplies away from the Project site(s).
  - (ii) Any non-enrolled architect, engineer or surveyor and their consultants except where required by the Contract Documents.
  - (iii) Truckers, material-delivery, vendors, suppliers, and operators (as independent contractors), whose operation(s) and/or employee(s) is/are engaged solely in the loading, hauling and/or unloading of material, supplies and/or equipment to or from the Project site(s).
  - (iv) Any employee(s) of the Contractor or an enrolled or non-enrolled Sub-Contractor of any tier, including employee(s) of truckers, material-delivery, vendors, suppliers, and operators (as independent contractors), which is/are engaged solely in the loading, hauling and/or unloading of material, supplies and/or equipment to or from the Project site(s).
  - (v) Any employee(s) of the Contractor or an enrolled Sub-Contractor of any tier that does not work and/or generate payroll at the Project site(s).

- (vi) Any employee(s) of the Contractor or an enrolled Sub-Contractor of any tier, not specifically required to perform Work at the Project site(s), that occasionally visits the Project site(s) to make deliveries, pick up supplies and/or personnel, to perform supervisory and/or progress inspections, or for any other reason.
  - (vii) Any other entity specifically to be determined by the County to be excluded.
  - (viii) Any leased or temporary laborers.
- (c) Unless herein otherwise specifically indicated, the policies set forth in Subparagraphs 11.1.3.2, 11.1.3.3 and 11.1.3.4 below shall cover only those operations of the insured parties performed at the Project site or sites incidental to the Work called for in this Owner-Contractor Agreement.
- (d) The County assumes no obligation to provide insurance other than that evidenced by the policies referred to in Subparagraphs 11.1.3.2, 11.1.3.3 and 11.1.3.4. Furthermore, any obligation of the County to provide insurance under its OCIP is expressly limited to the insurance referred to in Subparagraphs 11.1.3.2, 11.1.3.3 and 11.1.3.4. The County, however, reserves the right to furnish insurance coverage of various types and limits, provided that such coverage shall not be less than that specified below (so long as such insurance and limits are reasonably available in the insurance market) and provided that the costs of such insurance shall be borne by the County.

#### 11.1.3.2 WORKERS' COMPENSATION INSURANCE

Workers' Compensation insurance in statutory limits of the Workers' Compensation laws of the State of Georgia, with Coverage B - Employer's Liability, to limits of not less than one million dollars (\$1,000,000) covering operations of the insured parties at the Project site. Coverage under the Broad Form All States extension is also included. This insurance is primary for all occurrences at the Project site.

#### 11.1.3.3 LIABILITY INSURANCE (EXCLUDING MOTOR VEHICLE LIABILITY)

- (a) Liability insurance (excluding Motor Vehicle Liability) under a Commercial General Liability insurance policy and covering the insured parties in connection with the performance of the Work at the Project site, including hazards of operations (explosion, collapse and underground exposures), independent contractors, employees as additional insureds, completed operations (for 5 years after final completion of the Work), contractual liability coverage (for contracts related to the Work), personal injury liability coverage, and excess Employer's Liability coverage for claims arising out of the Work hereunder, for personal injury, bodily injury, and property damage, in policies of insurance such that the total available limits to all insureds combined will not be less than twenty-five million dollars (\$25,000,000) combined single limits for each occurrence and aggregates, as applicable.

- (b) Notwithstanding the actual policy deductible, the Contractor shall be liable for a deductible not to exceed five thousand dollars (\$5,000) each occurrence, to the extent losses payable are attributable to, involve, or relate to the performance, actions, errors, omissions, or negligence of the Contractor or its Sub-Contractors, uninsured parties, or any other entity or person for whom it may be responsible. The Contractor's deductible shall include the costs of defense, including court costs and attorneys' fees of a covered OCIP claim and shall not be construed to affect the Contractor rights to indemnify the County under the contract. All such deductibles shall be collected as part of the Contract close-out process and final payment.
- (c) The insurance provided under the OCIP will not extend coverage for products liability to any insured party or uninsured party. However, Products/Completed Operations liability arising from manufacturing or assembly of items manufactured or assembled at the Project site, as required by the contract, is covered.

#### 11.1.3.4 ALL RISK BUILDER'S RISK, INCLUDING TRANSIT

- (a) All Risk Builder's Risk, including transit and installation risks, insuring the interest of the County, the Contractor and its Sub-Contractors, providing coverage on an All Risk basis, including, but not limited to, coverage against flood, fire, lightning, wind damage, hail, explosion, riot or civil commotion, aircraft and other vehicles, and collapse.
- (b) The policies for such insurance will be secured and maintained by the County in a form and amount as determined by Fulton County. The amount may be amended depending on the amount of a specific project.
- (c) Coverage will include materials, supplies and equipment that are intended for specific installation in the Work while such materials, supplies and equipment are located at the Project site, in transit or while temporarily located away from the Project site for the purpose of repair, adjustment or storage at the risk of one of the insured parties.
- (d) Except as otherwise provided in Subparagraph 11.1.3.4(c), this insurance will not include coverage for tools or clothing of workers, or tools, equipment, protective fencing, scaffolding, temporary structures, coffer damming, pipe stulling or bracing, or forms owned, rented or used by the Contractor, its Sub-Contractors, or uninsured parties and used in the performance of the Work, unless such items are specifically identified in this Agreement and their values declared under the Builder's Risk insurance policy.
- (e) The County, its officers, agents, employees and consultants rendering services at the Project site, and the OCIP Administrator will not be liable or responsible for loss or damage to the items excluded in Subparagraph 11.1.3.4(d), and the Contractor shall indemnify and hold harmless the County, its officers, agents, employees, its consultants rendering services at the Project site, the OCIP Administrator, and other Project contractors and their Sub-

Contractors from claims or causes of action brought by any person or parties as a result of loss or damage to such excluded items.

- (f) The Builder's Risk policy will be endorsed waiving the carrier's rights of recovery under subrogation against the County, its officers, agents, employees and consultants rendering services at the Project site, the OCIP Administrator, and the Contractor and its Sub-Contractors, whose respective interests are insured under such policy.
- (g) Notwithstanding the actual policy deductible, the Contractor shall be liable for a deductible not to exceed five thousand dollars (\$5,000) each occurrence for all perils excluding theft and mysterious disappearance, and twenty-five thousand dollars (\$25,000) each occurrence for theft and mysterious disappearance. All such deductibles shall be collected as part of the Contract close-out process and final payment.

#### 11.1.3.5 CONTRACTOR RETAINS VARIOUS OBLIGATIONS

Nothing contained herein, or in any document referenced herein, shall relieve, limit or be construed to relieve or limit the Contractor, its Sub-Contractors or uninsured parties of responsibility or obligations otherwise imposed by the Contract. The OCIP shall not be construed as limiting, among other things:

- (a) The extent to which the Contractor may be held legally responsible for damages to persons or property.
- (b) The Contractor's indemnity obligations under this Agreement.

#### 11.1.3.6 CONTRACTOR RESPONSIBILITY TO REPAIR DEFECTIVE OR DAMAGED WORK

- (a) Notwithstanding the provisions of this Agreement, and until final acceptance of the Work by the County, the Contractor shall have full and complete charge and care of the Work or any portion thereof (including the Owner-furnished supplies, material, equipment or other items to be utilized or incorporated in the Work).
- (b) The Contractor shall rebuild, repair, restore and make good losses of, and injuries or damages to, the Work or any portion thereof (including the Owner-furnished supplies, material, equipment or other items to be utilized with, or incorporated in, the Work and which are in the Project site) before final acceptance of the Work. Such rebuilding, repair or restoration shall be at the Contractor's sole cost and expense provided, however, the County will make available applicable proceeds from the Builder's Risk policy provided by the County, as specified in Section 11.1.3.4.

#### 11.1.3.7 ADDITIONAL INSURED

The Additional Insured on the County's OCIP policies shall include Fulton County; the County's officers, agents, employees, and consultants; the OCIP Administrator; and Contractors, including their Sub-Contractors of any tier (but excluding suppliers, vendors, material-delivery, truckers or haulers) whom Fulton County has contracted with and for whom the County has agreed to furnish coverage under the OCIP.

#### 11.1.3.8 OWNER'S RIGHT TO AUDIT

- (a) The Contractor hereby warrants to the County the accuracy of the information provided on the OCIP Insurance Information Form submitted with its bid, and agrees that the County, its officers, agents, insurance carriers and the OCIP Administrator may audit the records of the Contractor and its Sub-Contractors to confirm the accuracy of the information provided, including, but not limited to, the accuracy of all estimated payrolls, and to ascertain any effect on insurance resulting from changes in the Work. The audit will be held during the Contractor's normal business hours at the office of the Contractor or at another mutually agreeable location.
- (b) The County shall be entitled to credits in OCIP insurance premiums that may accrue as a result of the audit.
- (c) The Contractor shall maintain or cause to be maintained sufficient records as may be necessary to audit its compliance and its Sub-Contractors' compliance with the requirements of the OCIP.

#### 11.1.3.9 ASSIGNMENT

The Contractor and each of its Sub-Contractors of any tier shall assign to the County all return premiums, premium refunds, dividends and other monies due or to become due in connection with the insurance provided by the County. The Contractor and its Sub-Contractors of any tier shall execute such other further documentation as may be required by the County to effectuate this assignment.

#### 11.1.3.10 OCIP CLAIMS

The Contractor, its Sub-Contractors and uninsured parties shall assist the County, its agents, and the OCIP Administrator and provide the utmost cooperation in the adjustment of claims arising out of the operations conducted under, or in connection with, the Work and shall cooperate with the County's insurance carriers in claims and demands that arise out of the Work and that the insurance carriers are called upon to adjust or resist.

#### 11.1.3.11 LIMITATIONS ON OCIP COVERAGES

Although the scope of coverages afforded under this program may provide coverage beyond the scope required by the Owner-Contractor Agreement in the absence of an OCIP, the County makes no warranty or representation that such broad coverage will remain in effect throughout the duration of the Work. The County further does not warrant or represent that the OCIP coverages constitute an insurance portfolio, which adequately addresses all the risk faced by the Contractor or its Sub-Contractor(s). The Contractor and Sub-Contractors of every tier shall satisfy themselves as to the existence, extent and adequacy of the OCIP coverages prior to the commencement of the Work. The cost to obtain any "extra" coverages shall be the responsibility of the Contractor. The County shall not assume any responsibility for the premium cost of any "extra" insurance. The County shall issue Certificates of Insurance and make available copies of specimen insurance policies at the time of the Notice to Proceed.

#### 11.1.3.12 ALTERNATIVE INSURANCE

In the event the County, after commencement of the Work, is unable to furnish, or elects not to furnish or to continue to furnish, the insurance coverage herein described, and upon 30 days written notice from the County, the following shall be required:

- (a) The Contractor shall secure and maintain all, or as much of the insurance herein described, as the County designates, at the County's expense, and the County will thereafter no longer be obligated to furnish such insurance.
- (b) All insurance secured by the Contractor or its Sub-Contractors pursuant to this subparagraph shall be in policies subject to the prior written approval of the County as to form, content, limits of liability, cost and issuing company as outlined in the "Base Bid" version of this Article 11, i.e., as if the OCIP had not been implemented for the Project.

#### 11.1.3.13 PROCEDURES AND SERVICES

The Contractor shall fully comply with, and shall require its Sub-Contractors of any tier to fully comply with, all of said plans, procedures and services, including but not limited to, completion of all necessary applications for coverage, prompt and full compliance with all audit requests and claim reporting procedures, and full compliance with the safety, loss prevention and loss control programs implemented by, or at the request of the County.

#### 11.1.3.14 INSURANCE NECESSARY FOR THE WORK, BUT COVERING OPERATIONS OUTSIDE THE OCIP

- (a) The Contractor shall, for the duration of this Agreement, provide and maintain insurance and shall require each Sub-Contractor to provide and maintain insurance of the type and in the limits as described in Paragraph 11.2, which is intended to cover employee injury, personal

injury, bodily injury and property damage liability for ongoing operations work performed away from the Project site.

- (b) The insurance described in Subparagraphs 11.2.1.2.B (Motor Vehicle Liability) and 11.2.1.2.D (Professional Liability) shall apply to Work performed by both enrolled and non-enrolled entities both at and away from the Project site, and shall be provided and maintained for the duration of this Agreement. Such insurance shall name the parties required to secure same as insureds and shall be in a form and through issuing companies acceptable to the County. Such insurance shall contain a defense of suits provision.
- (c) The Contractor shall assure that all non-enrolled entities provide and maintain, for the duration of this Agreement, insurance of the type and in the limits as described in Paragraph 11.2, which shall cover those entities for employee injury, personal injury, bodily injury, and property damage liability for any Work performed at the Project site.

#### 11.1.3.15 CONTRACTOR OCIP OBLIGATIONS

- (a) The Contractor and each of its Sub-Contractors shall:
  - (i) Furnish to Fulton County's designated Representative all information and documentation that the County may require from time to time, in connection with the issuance of policies under this Agreement, in such form and substance as the OCIP Administrator may prescribe.
  - (ii) Furnish to the County's designated Representative monthly certified payroll and accident summary reports on forms provided by the OCIP Administrator, and payroll records, as required.
  - (iii) Segregate their respective reports relating to the Work for which OCIP coverage is herein provided, from their records relating to other work for which such coverage is not provided.
  - (iv) Promptly comply with the recommendations of the OCIP insurance carriers, as submitted through the County's designated Representative.
- (b) The Contractor shall not violate or knowingly permit to be violated any conditions of the policies of insurance provided by the County under the terms of this Agreement, and shall at all times satisfy the requirements of the issuing insurance companies.
- (c) The Contractor shall assure that all OCIP requirements imposed upon and to be performed by the Contractor shall likewise be imposed upon, assumed and performed by each of its Sub-Contractors and uninsured parties with whom it or its Sub-Contractors have a contractual relationship and are performing work under the Contract.

- (d) The Contractor shall furnish each bidding and negotiating Sub-Contractor, vendor, supplier, material dealer or other person or business entity that may provide goods or services in connection with the Work, a copy of this document describing the insurance requirements for the Contractor, and its Sub-Contractors shall require each to impose the same requirement in their subcontracting and procurement procedures.
- (e) If the Contractor or any of its Sub-Contractors should fail to comply with the requirements of this document, the County may withhold payments due to the Contractor or suspend the Work until such time as the Contractor and its Sub-Contractors have performed such obligations to the reasonable satisfaction of the County.
- (f) The Contractor agrees that the Contract Sum includes all costs of complying with the OCIP, as herein described.

#### 11.1.3.16 NOTICES, COSTS AND LOSSES

- (a) All policies of insurance that either the Contractor, its Sub-Contractors, or the County is required to secure and maintain, shall be endorsed to provide that the insurance company shall notify the County, the Contractor, and each Named Insured at least thirty (30) days prior to the effective date of any cancellation or modification of such policies.
- (b) The Contractor shall furnish to the County's designated Representative certificates of insurance for insurance required to be maintained by the Contractor and its Sub-Contractors, as provided herein. Prior to the issuance of the Notice to Proceed, the Contractor shall not be permitted on the Project site.
- (c) The County will pay the cost of the premiums for the insurance described above as being provided by the County, and the County will receive and pay, as the case may be, all adjustments in such costs, whether by way of dividends or otherwise. The Contractor shall execute such instruments of assignment as may be necessary to permit the County's receipt of such adjustments and shall cause all Sub-Contractors covered by such insurance to do the same.
- (d) The Contractor shall be responsible for the payment of the deductible amounts indicated in Subparagraphs 11.1.3.3 and 11.1.3.4. If the actual County-provided OCIP policies have deductible amounts greater than those indicated in Subparagraphs 11.1.3.3 and 11.1.3.4, such excess amounts will be paid by the Contractor.
- (e) The Contractor shall be responsible for all losses greater than OCIP policy limits.
- (f) Payments by the insurer for all losses covered under the All Risk Builder's Risk policy, as specified in Section 11.1.3.4, will be made to the County. The County will make proceeds from the Builder's Risk policy available to the Contractor for rebuilding work damaged by covered perils.

#### 11.1.3.17 SUBROGATION AND WAIVER

- (a) The Contractor shall require all policies of insurance that are related to the Work and that are secured and maintained by the Contractor and its Sub-Contractors to include clauses providing that each underwriter and carrier shall waive all of their respective rights of recovery, under subrogation or otherwise, against the County, its officers, agents, employees and consultants rendering services at the Project site, the OCIP Administrator, the Contractor and its Sub-Contractors, regardless of tier, and all other Project contractors and their Sub-Contractors, regardless of tier.
- (b) The Contractor waives all rights of recovery against its Sub-Contractors, the County, its officers, agents, employees and consultants rendering services at the Project site, the OCIP Administrator, and other Project contractors and their Sub-Contractors, regardless of tier, that the Contractor may have or acquire because of deductible clauses in or inadequacy of limits of policies of insurance that are in any way related to the Work and that are secured and maintained by the Contractor.
- (c) The Contractor shall require its Sub-Contractors of every tier to waive the rights of recovery in the same manner (as waived in the preceding paragraph by the Contractor) against the County, its officers, agents, employees and consultants rendering services at the Project site, the OCIP Administrator, the Contractor, and other Project contractors and their Sub-Contractors, regardless of tier.

#### 11.1.3.18 COVERAGE DETERMINED BY POLICY

The coverages referred to above are set forth in full in the respective policy forms, and the foregoing descriptions of such policies are not intended to be complete, or to alter or amend any provision of the actual policies, and in matters, if any, in which the said description may be conflicting with such instruments, the provisions of the policies of the insurance shall govern.

#### 11.2 CONTRACTOR'S LIABILITY INSURANCE

- 11.2.1 Pursuant to the exclusions of the Owner-Controlled Insurance Program (OCIP) described in Paragraph 11.1 above, the Contractor shall purchase and maintain during the life of this Agreement, from a company or companies licensed to do business in its agents and acceptable to the County, such insurance as shall fully protect him, the County, any other Professional Consultant or Architect or Engineer hired by the County, and any parties, consultants, or Sub-Contractors performing work covered by this Agreement from any and all claims, including those resulting from bodily injury (including accidental death), professional liability of the property damage (other than to the work itself) or personal injury which may arise or result from the Contractor's operations under this Agreement **which are not covered under the OCIP**, whether such operations be by himself or by any Sub-Contractor, or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.

- (a) Said insurance shall specifically provide coverage during the life of this Agreement to the County, its agents, any Professional Consultant or Architect or Engineer hired by the County,

and any Sub-Contractor performing work covered by this Agreement for claims made by any persons, including the employees and parties in privity of the contract with the Contractor, claiming injury as a result of the performance of the Project.

- (b) At a minimum, such insurance must include but not necessarily be limited to:
- (i) Worker's Compensation and Employer's Liability insurance (**for all operations away from the Project site**);
  - (ii) Motor Vehicle Liability insurance, covering all motor vehicles, whether owned, non-owned, or hired (**for all operations both at and away from the Project site**);
  - (iii) Comprehensive (or Commercial) General Liability insurance, with Broad Form Liability endorsement. Comprehensive (or Commercial) General Liability policy with Broad Form Liability endorsement shall be further endorsed naming County, the Construction Manager, and County's Professional Consultants as additional insured (**for all operations away from the Project site**).
  - (iv) Professional Liability insurance, specifying that the Contractor shall be responsible to the County for acts, errors and omissions of the Contractor's directors, officers, employees and parties in privity of the contract with the Contractor to perform a portion of the work, including their agents and employees (**for all operations both at and away from the Project site**). The Contractor shall require the architects and the engineers that are responsible for the design and engineering to purchase and maintain liability insurance with no less coverage than \$1,000,000.00 or 10% of the construction value of the Work, whichever is greater, throughout the duration of the project and for two years following the Date of Substantial Completion.

11.2.2 The insurance required by Subparagraph 11.2.1 above shall be written for not less than the following liability limits, or greater if required by law. Evidence of such insurance shall be provided PRIOR to the day of actual work being performed (refer to OCIP Enrollment procedures provided by the OCIP Administrator for more assistance, or contact Fulton County's designated Representative.)

- (a) Worker's Compensation - in compliance with Georgia Workers Compensation Acts and any other State or Federal Acts or Provisions in which jurisdiction may be granted.

Employer's Liability Insurance	By Accident	Each Accident	\$ 500,000
Employer's Liability Insurance	By Disease	Policy Limit	\$ 500,000
(Aggregate)	By Disease	Each Employee	\$ 500,000

Commercial General Liability – including contractual Liability Insurance

Bodily Injury/Property Damage	Each Occurrence	\$1,000,000
Personal/Advertising Injury	Limits	\$1,000,000
Fire Damage	Limits	\$ 100,000

Business Automobile Liability

Combined Single Limits	Each Occurrence	\$1,000,000
(Including operation of non-owned, owned, and hired automobiles)		

<u>Electronic Data Processing Liability</u> (Required if computer contractor)	Limits	\$1,000,000
<u>Umbrella Liability</u> (In excess of noted coverages)	Each Occurrence	\$2,000,000
<u>Professional Liability</u> (Required if bid/quotation includes professional services) Limit of \$1,000,000 or 10% of Contract value, whichever is greater.		
<u>Fidelity Bond</u> (Employee Dishonesty)	Each Occurrence	\$ 100,000

**BUILDERS RISK**

"All-risk" form of builder's risk insurance providing coverage against loss or damage by fire or other peril on an "all-risk" form, including demolition and increased cost of construction, debris removal and the full replacement cost of the Project foundations and containing an agreed amount endorsement, and, until Final Completion and Acceptance of the Project. Such policy of insurance shall contain at least the following sub-limits of insurance and deductibles:

**Sublimits:**

Property in Transit	\$1,000,000
Property in Offsite Storage	\$1,000,000
Plans & Blueprints	\$ 25,000
Debris Removal	25% of Insured Physical Loss

**Deductibles:**

Flood and Earthquake	\$ 25,000
Water Damage other than Flood	\$ 00,000
All other Perils	\$ 10,000

Owner and Contractor waive all rights against each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 4.2.5 or other property insurance applicable to the Work, accept such rights as they have to the proceeds of such insurance.

Certificates shall state that the policy or policies shall not expire, be cancelled or altered without at least thirty (30) days prior written notice to Fulton County Government. Policies and Certificates of Insurance are to list Fulton County Government as an Additional Insured (except for Workers' Compensation) and shall conform to all terms and conditions (including coverage of the indemnification and hold harmless agreement) contained in the Insurance and Risk Management Provisions.

If Fulton County Government shall so request, the Offeror, Contractor or Vendor will furnish the County for its inspection and approval such policies of insurance with all endorsements, or confirmed specimens thereof certified by the insurance company to be true and correct copies.

Such certificates and notices shall be sent to:

Fulton County Government – Purchasing Department  
130 Peachtree Street, S.W.  
Suite 1168  
Atlanta, Georgia 30303-3459

**Insurance in no way Limits the Liability of the Respondent**

**Note:** The Contractor shall provide and shall require all Sub-Contractors performing work under this Agreement to obtain an insurance certificate showing proof of insurance coverage conforming to the above limits, and showing FULTON COUNTY GOVERNMENT as the "Certificate Holder" and "Additional Insured". The Contractor/Vendor shall insure that the ITB proposal number and Project Description appear on the Certificate of Insurance. Without such certificate, the Contractor and any Sub-contractor are considered NON-ENROLLED in OCIP, and cannot commence work.

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## ARTICLE 12

### CHANGES IN THE WORK

#### 12.1 CHANGE ORDERS

12.1.1 A Change Order is a written order to the Contractor signed to show the approval and the authorization of the County, issued after execution of the Contract, authorizing a change in the Work and/or an adjustment in the Contract Sum or the Contract Time. Change Orders shall be written using the Fulton County Change Order format and processed per Fulton County Change Order Policy 800-6. The Contract Sum and the Contract Time may be changed only by Change Order presented to and approved by the Fulton County Board of Commissioners. A Change Order signed by the Contractor indicates the Contractor's agreement therewith, including the adjustment in either or both of the Contract Sum or the Contract Time.

12.1.2 The cost or credit to the County resulting from a change in the Work shall be determined in one or more of the following ways:

12.1.2.1 by mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

12.1.2.2 by unit prices stated in the Contract Documents or subsequently agreed upon;

12.1.2.3 by cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

12.1.2.4 by the method provided in Subparagraph 12.1.3 below.

12.1.3 If none of the methods set forth in Subparagraphs 12.1.2.1, 12.1.2.2 or 12.1.2.3 above is agreed upon, the Contractor, provided a written order signed by the Construction Manager is received, shall promptly proceed with the Work involved. The cost of such Work shall then be determined by the Construction Manager on basis of the reasonable expenditures and savings of those performing the Work attributable to the change. The cost of the change shall include only the items listed in Subparagraph 12.1.4.1 below, and in the case of either a decrease or an increase in the Contract Sum, an allowance for overhead and profit in accordance with Subparagraphs 12.1.4.2 and 12.1.5 below shall be applied to the cost or credit.

12.1.3.2 In such case, and also under Subparagraph 12.1.3.3 above, the Contractor shall keep and present, in such form as the Construction Manager may prescribe, an itemized accounting of all actual costs expended, together with appropriate supporting data for inclusion in a Change Order.

12.1.3.2 All hourly rate charges shall be submitted to the Construction Manager for prior review and approval. All hourly rate charges shall be properly supported as required by the Construction Manager with certified payrolls, or their acceptable equivalent. When authorized to proceed for a given change and actual expenditures have been made prior to execution of a Change Order for the entire change, such actual expenditures may be summarized monthly, and if approved, incorporated into a Change Order. When both additions and credits covering related Work or substitutions are involved in any one change, the allowance for overhead and profit shall be figured on the basis of the net increase or decrease, if any, with respect to that change.

12.1.4 In Subparagraphs 12.1.3 and 12.1.4 above, the items included in "Cost" and "Overhead" shall be based on the following schedule:

- 12.1.4.1 Unless otherwise provided in the Contract Documents, "Cost" shall be limited to the following: cost of materials incorporated into the Work, including sales tax and cost of delivery; cost of direct labor (labor cost may include a pro rata share of foreman's account of the change) including social security, old age and unemployment insurance, and fringe benefits required by agreement or custom; workers' or workmen's compensation insurance; rental value of equipment and machinery; costs for preparing Shop Drawings.
- 12.1.4.2 Unless otherwise provided in the Contract Documents, "Overhead" shall include the following: bond and insurance premiums including increase and decreases from change in the Work, supervision, superintendence, construction parking, wages of timekeepers, watchmen and clerks, small tools, consumable supplies, expendables, incidentals, general office expense, the cost of additional reproduction for the Contractor's subcontractors beyond that agreed upon in the Contract Documents, construction parking, any additional costs of craft supervision by the Contractor's or subcontractors' superintendents, and overhead charges which would be customary and expended regardless of the change in the Work due to other overlapping activities which are included as part of the original Contract, and all other expenses not included in "Cost" above.
- 12.1.4.3 In the event that a change is issued by the County which would require the expenditure of substantial amounts of special supervision (beyond the foreman level) by the Contractor, the Contractor may, at the sole direction of the Construction Manager, be allowed to incorporate these charges into the agreement cost for the change.
- 12.1.5 In Subparagraphs 12.1.3 and 12.1.4 above, the allowance for overhead and profit combined, included in the total cost or credit to the County, shall be based on the following schedule:
- 12.1.5.1 For the Contractor, for any work performed by the Contractor's own forces, ten (10) percent of the cost.
- 12.1.5.2 For the Contractor, for any work performed by a Contractor's subcontractor, five (5) percent of the amount due the subcontractor.
- 12.1.5.3 For each subcontractor or sub-subcontractor involved, for any work performed by that subcontractor's or sub-subcontractor's own forces, ten (10) percent of the cost.
- 12.1.5.4 For each subcontractor, for work performed by a sub-subcontractor, five (5) percent of the amount due to the sub-subcontractor.
- 12.1.5.5 Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 12.1.5 above unless modified otherwise.
- 12.1.6 In order to facilitate checking of quotations for extras or credits, all proposals or bids, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs, including labor cost, materials and subcontracts. Labor and materials shall be itemized in the manner defined in Subparagraph 12.1.4 above. Where major cost items are subcontracts, they shall be itemized also. In no case shall a change be approved without such itemization.
- 12.1.7 No payment shall be made for any changes to the contract that are not included in a fully executed Change Order.
- 12.2 CONCEALED CONDITIONS

12.2.1 Should concealed conditions be encountered in the performance of the Work below the surface of the ground, or should concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the Contract Documents, or should unknown physical conditions below the surface of the ground or concealed or unknown conditions in an existing structure of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract, be encountered, the Contract Sum and Contract Time shall be equitably adjusted by Change Order upon request by either party made within twenty (20) days after the first observance of the conditions. No such request for equitable adjustment shall be valid unless the Contractor complies with this (20) days notice and Subparagraph 12.3.1 below.

### 12.3 REQUESTS FOR ADDITIONAL COST

12.3.1 If the Contractor wishes to request an increase in the Contract Sum, the Contractor shall give the Construction Manager written notice thereof within twenty (20) days after the occurrence of the event, or identification of the conditions, giving rise to such request. This notice shall be given by the Contractor before proceeding to execute the Work, except in an emergency endangering life or property in which case the Contractor shall proceed in accordance with Paragraph 10.7 of this Agreement, and Subparagraph 12.1.4 above. No such request shall be valid unless so made within the twenty (20) days specified above. If the County and the Contractor cannot agree on the amount of the adjustment in the Contract Sum, it shall be determined by the Construction Manager. Any change in the Contract Sum resulting from such claim shall be documented by Change Order.

12.3.2 If the Contractor claims that additional cost is involved because of, but not limited to (1) any interpretation pursuant to Subparagraph 2.2.7 of this Agreement, (2) any order by the County to stop the Work pursuant to Paragraph 3.3 of this Agreement where the Contractor was not at fault, or any such order by the Construction Manager as the County's agent, or (3) any written order for a minor change in the Work issued pursuant to Paragraph 12.4 below, the Contractor shall submit a request for an increase in the Contract Sum as provided in Subparagraph 12.3.1 above. No such claim shall be valid unless the Contractor complies with Subparagraph 12.3.1 above.

### 12.4 MINOR CHANGES IN THE WORK

12.4.1 The Architect and the Construction Manager will have authority to order minor changes in the Work not involving an adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order issued by the Construction Manager, and shall be binding on the County and the Contractor. The Contractor shall carry out such written orders promptly.

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## ARTICLE 13

### UNCOVERING AND CORRECTION OF WORK

#### 13.1 UNCOVERING OF WORK

13.1.1 If any portion of the Work should be covered contrary to the request of the Architect or the Construction Manager, or to requirements specifically expressed in the Contract Documents, the work must, if requested in writing, be uncovered for their observation and shall be replaced at the Contractor's expense.

13.1.2 If any other portion of the Work has been covered which the Architect or the Construction Manager has not specifically requested to observe prior to its being covered, either may request to see such Work and it shall be uncovered by the Contractor. If such Work be found in accordance with the Contract Documents, the cost of uncovering and replacement shall, by appropriate Change Order, be submitted to the Construction Manager. If such Work be found not in accordance with the Contract Documents, the Contractor shall pay such costs unless it be found that this condition was caused by the County or a separate contractor as provided in Article 6 of this Agreement, in which event the County shall be responsible for the payment of the cost of uncovering and replacing the cover, and the cost of repair of any damage to the Work shall be borne by the party responsible as provided in Article 6 of this Agreement.

#### 13.2 CORRECTION OF WORK

13.2.1 The Contractor shall, within seven (7) days after notice, commence correction of all Work rejected by the Architect or the Construction Manager as defective or as failing to conform to the Contract Documents whether observed before or after Substantial Completion of the Work and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected Work, including compensation for the Architect's and the Construction Manager's additional services made necessary thereby.

13.2.2 If within one (1) year after the Date of Substantial Completion of the Project or designated portion thereof, or within one year after acceptance by the County of designated equipment, or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty 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 commence correction within 14 days after receipt of a written notice from the County to do so unless the County has previously given the Contractor a written acceptance of such condition. This obligation shall survive both final payment for the Work or designated portion thereof and termination of the Contract.

13.2.2.1 The warranty against defects in equipment and workmanship on all mechanical and electrical equipment and work shall be for the specified period of time of normal operation without breakdown or malfunction.

13.2.2.2 The warranty period for mechanical and electrical equipment shall begin at the Date of Substantial Completion of the Work or from the date the equipment is put into normal operation after a breakdown or malfunction that occurred after the Date of Substantial Completion of the Work, but before the date of Final Completion, whichever date is the later.

13.2.3 The Contractor shall remove from the site all portions of the Work which are defective or nonconforming and which have not been corrected under Subparagraphs 4.6.1, 13.2.1 and 13.2.2 of this Agreement, unless removal is waived by the County.

- 13.2.4 If the Contractor fails to correct defective or nonconforming Work as provided in Subparagraphs 4.6.1, 13.2.1, and 13.2.2 of this Agreement, the County may correct it in accordance with Paragraph 3.4 of this Agreement.
- 13.2.5 If the Contractor does not proceed with the correction of such defective or nonconforming Work within the time limits set herein, the County may remove it and may store the materials or equipment at the expense of the Contractor. If the Contractor does not pay the cost of such removal and storage within ten (10) days thereafter, the County may, upon ten (10) additional days' written notice, sell such Work at auction or at private sale and shall account for the net proceeds thereof, after deducting all the costs that should have been borne by the Contractor, including compensation for the Architect's and the Construction Manager's additional services made necessary thereby. If such proceeds of sale do not cover all costs which the Contractor should have borne, the difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the County.
- 13.2.6 The Contractor shall bear the cost of making good all Work of the County or separate contractors destroyed or damaged by correction or removal of defective work.
- 13.2.7 Nothing contained in this Paragraph 13.2 shall be construed to establish a period of limitation with respect to any other obligation which the Contractor might have under the Contract Documents, including Paragraph 4.6 of this Agreement. The establishment of the time periods noted in Subparagraph 13.2.2 above, or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents, relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the Contractor's obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.
- 13.3 ACCEPTANCE OF DEFECTIVE OR NONCONFORMING WORK
- 13.3.1 If the County prefers to accept defective or nonconforming Work, the County may do so instead of requiring its removal and correction, in which case a Change Order shall be issued to reflect a reduction in the Contract Sum where appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

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## ARTICLE 14

### TERMINATION OF THE CONTRACT

#### 14.1 TERMINATION FOR DEFAULT

14.1.1 This Contract may be terminated for default by the County upon the occurrence of any of the following events:

14.1.1.1 Persistent failure or refusal on the part of the Contractor to perform the Work in accordance with the Contract Documents, including, but not limited to, failure or refusal to supply enough properly skilled workers or suitable materials or equipment, or failure to adhere to the required construction scheduling responsibilities;

14.1.1.2 Insolvency or bankruptcy of the Contractor, whether voluntary or involuntary;

14.1.1.3 Any general assignment by the Contractor for the benefit of creditors;

14.1.1.4 Appointment of a trustee, receiver, custodian, or agent of the Contractor for the benefit of creditors or for the purpose of enforcing a lien against the property of the Contractor;

14.1.1.5 Written admission by the Contractor of its inability to pay its debts generally as they become due;

14.1.1.6 Disregard on the part of the Contractor of laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction; or

14.1.1.7 Substantial violation of any other provision of the Contract Documents.

14.1.2 Should any of the above events occur, and should the Contractor fail within seven (7) days after receipt of written notice to commence and continue correction of such default, neglect or violation with diligence and promptness, the County may, after seven (7) days following receipt by the Contractor of an additional written notice and without prejudice to any other remedy the County may have, terminate the services the Contractor and take possession of the site and of all materials, equipment, tools, construction equipment and machinery thereon owned by or in the possession of the Contractor, and may finish the Work by whatever methods the County may deem expedient.

14.1.3 If the unpaid balance of the Contract Sum exceeds the cost of finishing the Work, including compensation for the Construction Manager's, the Architect's, and the County's other Professional Consultant's additional services made necessary thereby, such excess shall be paid to the Contractor. However, in such case the Contractor shall not be entitled to receive any payment until the Work is finished. If the cost of finishing the Work exceeds the unpaid balance of the Contract Sum, the Contractor shall pay the difference to the County. The amount to be paid to the Contractor or to the County, as the case may be, shall be made, upon application, in the manner provided in Article 9 of this Agreement, and this obligation for payment shall survive the termination of the Contract.

#### 14.2 TERMINATION FOR CONVENIENCE OF THE COUNTY

14.2.1 Immediately upon receipt of written notice to the Contractor, or within such time as may otherwise be specified in such notice, the County may, without cause and without prejudice to any other right or remedy, terminate this Contract, in whole or in part, for its convenience.

14.2.2 In the event of termination in accordance with Subparagraph 14.2.1 above, the Contractor shall be paid for all Work performed and acceptable to the County, and any expense sustained shall be limited to the cost of such Work plus reasonable termination expenses, to include costs required for an orderly shutdown of the Work on site.

14.3 TERMINATION PROVISIONS

14.3.1 After receipt of written notice of termination from the County pursuant to Paragraph 14.1 or 14.2, the Contractor shall:

14.3.1.1 Stop work on the date and to the extent specified in the notice of termination;

14.3.1.2 Place no further purchase orders or subcontracts for materials, equipment, supplies, services, or facilities except as may be necessary for the completion of such portion of the Work under this Contract not terminated;

14.3.1.3 Terminate all purchase orders and subcontracts to the extent that they relate to the performance of the Work terminated by the notice of termination;

14.3.1.4 Assign to the County, in the manner, at the times, and to the extent directed by the County, all of the rights, title, and interests of the Contractor under the purchase orders and subcontracts so terminated, in which case the County shall have the right, at its discretion, to settle or pay any or all claims arising out of the termination of such purchase orders and subcontracts;

14.3.1.5 Transfer title and deliver to the County, in the manner, at the times, and to the extent directed by the County:

- a. The fabricated and unfabricated parts, Work in process, completed Work, supplies, and other material produced as a part of, or acquired in connection with, the performance of the Work terminated by the notice of termination; and
- b. The completed or partially completed plans, drawings, information, and other property related to the Work.

14.3.1.6 Complete performance of such part of the Work as shall not have been terminated by the notice of termination.

14.3.2 The Contractor acknowledges and agrees that if any court rules that termination by the County was a wrongful termination, such action by the County shall be deemed a termination for convenience, and the Contractor shall only be entitled to recover legitimate expenses up to the time of termination, and shall not be entitled to fees, costs, expenses, profits, or overhead after the date of termination.

\*\*\*\*\*

ARTICLE 15

**NON-DISCRIMINATION IN CONTRACTING & PROCUREMENT**

- 15.1.1 It is the policy of Fulton County that discrimination against businesses by reason of the race, color, gender or national origin of the ownership of any such business is prohibited. Furthermore, it is the policy of the Board of Commissioners that Fulton County and all vendors and contractors doing business with it shall provide to all businesses the opportunity to participate in contracting and procurement paid, in whole or in part, with monetary appropriations of the Board without regard to the race, color, gender or national origin of the ownership of any such business. Similarly, it is the policy of Fulton County that the contracting and procurement practices of Fulton County should not implicate Fulton County as a passive participant in discriminatory practices engaged in by private contractors or vendors who seek to obtain contracts with Fulton County.
- 15.1.2 The above policy is formalized in the “Ordinance providing for non-discrimination in purchasing and contracting; to provide for the monitoring of purchasing and contracting by the Department of Contract Compliance; to provide for the investigation by the Department of Contract Compliance regarding allegations of discrimination by persons or entities that do business with Fulton County; to provide for hearings regarding allegations of Discrimination; to provide for sanctions; and for other purposes”, established by the Fulton County Board of Commissioners on July 7, 1999.
- 15.1.3 A summary of the objectives and provisions of the ordinance, as well as forms required to be submitted by the Design/Builder, are included in Section 00 430 of the Bidding Manual.

\*\*\*\*\*

ARTICLE 16

**FULL PERFORMANCE REPRESENTATION**

By executing this Agreement, the undersigned Contractor declares and represents that it has reviewed and understands the Contract Documents and has examined the site of the Work and informed itself fully in regard to all conditions pertaining to the place where the Work is to be done, including those conditions affecting the cost of the Work and the delivery, handling and storage of equipment and materials at the place where the Work is to be executed; that the Contractor and its subcontractors have examined and read the Contract Documents; and it has satisfied itself that the Contract Documents are an adequate and acceptable reflection of Work which is required to be performed; that it is willing and able to perform all of the necessary Work based upon the information and representations contained within the Contract Documents; and that it shall perform such necessary Work according the requirements of the Contract Documents, for the price prescribed, and within the time allotted. The Contractor hereby agrees that no additional information is required to complete the Work within the cost and schedule constraints established and agreed upon within this Agreement.

\*\*\*\*\*

In witness whereof, the parties have executed this [*\*contract/agreement/amendment*] this \_\_\_\_ day of \_\_\_\_\_, 2006.

For \* [*Legal Name of Vendor*], Inc.

Attest:

\_\_\_\_\_  
\* [*Name of person signing for vendor*]

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
\* [*Title of person signing*]

(seal)

\_\_\_\_\_  
Name (Typed or Printed)

\_\_\_\_\_  
Title

For Fulton County

Attest:

\_\_\_\_\_  
Karen C. Handel, Chair  
Board of Commissioners

\_\_\_\_\_  
Mark Massey, Clerk to the Commissioners (seal)

Approved as to Content:

Approved as to Form:

\_\_\_\_\_  
Willie A. Hopkins, Jr., Director  
General Services Department

\_\_\_\_\_  
Office of the County Attorney

**END OF SECTION 00 500 - OWNER-CONTRACTOR AGREEMENT**

**SECTION 00 610 – BID BOND**

No bid for a contract in Fulton County for work to be done shall be valid for any purpose unless the Contractor shall give a Bid Bond with good and sufficient surety payable to, in favor of, and for the protection of Fulton County. The Bid Bond shall be in the amount of not less than 5% of the total amount payable by the terms of the Contract. No bid shall be read aloud or considered if a proper bid bond has not been submitted.

Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State of Georgia.

Attestation for the corporation must be by the corporate officer; for a partnership by another partner; for an individual by a notary with the corporate seal.

Following are forms containing required terms and conditions for performance and payment bonds.

**END OF SECTION 00 610, BID BOND**

**BID BOND**

**06ITB 49977K-RS SW ARTS PERFORMNACE THEATER  
FULTON COUNTY GOVERNMENT**

KNOW ALL MEN BY THESE PRESENTS, THAT WE \_\_\_\_\_

\_\_\_\_\_ hereinafter called the PRINCIPAL, and \_\_\_\_\_

\_\_\_\_\_ hereinafter call the SURETY, a corporation chartered and existing under the laws of the State of \_\_\_\_\_ and duly authorized to transact Surety business in the State of Georgia, are held and firmly bound unto the Fulton County Government, in the penal sum of \_\_\_\_\_ Dollars and Cents (\$ \_\_\_\_\_) good and lawful money of the United States of America, to be paid upon demand of the Fulton County Government, to which payment well and truly to be made we bind ourselves, our heirs, executors, and administrators and assigns, jointly and severally and firmly by these presents.

WHEREAS the PRINCIPAL has submitted to the Fulton County Government, for **06ITB 49977K-RS SW ARTS PERFORMANCE THEATER**, a Bid;

WHEREAS the PRINCIPAL desires to file this Bond in accordance with law:

NOW THEREFORE: The conditions of this obligation are such that if the Bid be accepted, the PRINCIPAL shall within ten (10) calendar days after receipt of written notification from the COUNTY of the award of the Contract execute a Contract in accordance with the Bid and upon the terms, conditions and prices set forth therein, in the form and manner required by the Fulton County Government, and execute sufficient and satisfactory Performance and Payments Bonds payable t the Fulton County Government, each in the amount of one hundred (100%) percent of the total contract price in form and with security satisfactory to said Fulton County Government, then this obligation to be void; otherwise, to be and remain in full force and virtue in law; and the SURETY shall upon failure of the PRINCIPAL to comply with any or all of the foregoing requirements within the time specified above immediately pay to the Fulton County Government, upon demand the amount hereof in good and lawful money of the United States of America, not as a penalty but as liquidated damages.

In the event suit is brought upon this Bond by the COUNTY and judgment is recovered, the SURETY shall pay all costs incurred by the COUNTY in such suit, including attorney's fees to be fixed by the Court.

Enclosed is a Bid Bond in the approved form, in the amount of

\_\_\_\_\_ Dollars  
(\$\_\_\_\_\_ ) being in the amount of five (5%) percent of the CONTRACT Sum. The

money payable on this bond shall be paid to the Fulton County Government, for the failure of the Bidder to execute a CONTRACT within ten (10) days after receipt of the Contract form and at the same time furnish a Payment Bond and Performance Bond.

*(Remainder of this page intentionally left blank)*

**IN TESTIMONY THEREOF**, the PRINCIPAL and SURETY have caused these presents to be duly signed and sealed this \_\_\_\_\_ day of \_\_\_\_\_, 2006.

ATTEST:

\_\_\_\_\_  
PRINCIPAL

\_\_\_\_\_  
BY \_\_\_\_\_ (SEAL)

**CERTIFICATE AS TO CORPORATE PRINCIPAL**

I, \_\_\_\_\_, certify that I am the Secretary of the Corporation named as principal in the within bond; that \_\_\_\_\_, Who signed the said bond of said corporation; that I know this signature, and his/her signature thereto is genuine; and that said bond was duly signed, sealed and attested for in behalf of said Corporation by authority of its governing body.

\_\_\_\_\_  
SECRETARY

(CORPORATE SEAL)

\_\_\_\_\_  
SURETY

\_\_\_\_\_  
(SEAL) BY \_\_\_\_\_

**SECTION 00 620 – PAYMENT & PERFORMANCE BONDS**

Following are forms containing required terms and conditions for performance and payment bonds.

**END OF SECTION 00 620, PERFORMANCE & PAYMENT BONDS**

## PAYMENT BOND

**KNOW ALL MEN BY THESE PRESENTS** that [insert name of contractor] (hereinafter called the "Principal") and [insert name of surety] (hereinafter called the "Surety"), are held and firmly bound unto **FULTON COUNTY**, a political subdivision of the State of Georgia (hereinafter called the "Owner"), its successors and assigns as obligee, in the penal sum of [100% of contract amount], lawful money of the United States of America, for the payment of which the Principal and the Surety bind themselves, their administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

**WHEREAS**, the Principal has entered, or is about to enter, into a certain written contract with the Owner, dated [insert date of contract], which is incorporated herein by reference in its entirety (hereinafter called the "Contract"), for construction-type services of a project known as [insert name of project], as more particularly described in the Contract (hereinafter called the "Project");

**NOW, THEREFORE**, the condition of this obligation is such that if the Principal shall promptly make payment to all persons working on or supplying labor or materials under the Contract, and any amendments thereto, with regard to labor or materials furnished and used in the Project, and with regard to labor or materials furnished but not so used, then this obligation shall be void; but otherwise it shall remain in full force and effect.

1. A "Claimant " all be defined herein as any subcontractor, person, party, partnership, corporation or the entity furnishing labor, services or materials used, or reasonably required for use, in the performance of the Contract, without regard to whether such labor, services or materials were sold, leased or rented, and without regard to whether such Claimant is or is not in privity of contract with the Principal or any subcontractor performing work on the Project, including, but not limited to, the following labor, services, or materials: water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.
2. In the event a Claimant files a lien against the property of the Owner, and the Principal fails or refuses to satisfy or remove it promptly, the Surety shall satisfy or remove the lien promptly upon written notice from the Owner, either by bond or as otherwise provided in the Contract.
3. The Surety hereby waives notice of any and all modifications, omissions, additions, changes, alterations, extensions of time, changes in the payment terms, and any other amendments in or about the Contract and agrees that the obligations undertaken by this Bond shall not be impaired in any manner by reason of any such modifications, omissions, additions, changes, alterations, extensions of time, changes in payment terms, and amendments.
4. The Surety hereby agrees that this Bond shall be deemed amended automatically and immediately, without formal or separate amendments hereto,

upon any amendment or modifications to the Contract, so as to bind the Principal and Surety, jointly and severally, to the full payment of any Claimant under the Contract, as amended or modified, provided only that the Surety shall not be liable for more than the penal sum of the Bond, as specified in the first paragraph hereof.

5. This Bond is made for the use and benefit of all persons, firms, and corporations who or which may furnish any materials or perform any labor for or on account of the construction-type services to be performed or supplied under the Contract, and any amendments thereto, and they and each of them may sue hereon.
6. No action may be maintained on this Bond after one (1) year from the date the last services, labor, or materials were provided under the Contract by the Claimant prosecuting said action.
7. This Bond is intended to comply with O.C.G.A. Section 36-91-1 et seq., and shall be interpreted so as to comply with the minimum requirements thereof. However, in the event the express language of this Bond extends protection to the Owner beyond that contemplated by O.C.G.A. Section 36-91-1 et seq. and O.C.G.A. Section 13-10-1, as amended, or any other statutory law applicable to this Project, then the additional protection shall be enforced in favor of the Owner, whether or not such protection is found in the applicable statutes.

**IN WITNESS WHEREOF**, the Principal and Surety have hereunto affixed their corporate seals and caused this obligations to be signed by their duly authorized representatives this of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_(SEAL)  
(Principal)

By:

Attest:

Secretary

\_\_\_\_\_(SEAL)  
(Surety)

By:

Attest:

Secretary

\_\_\_\_\_  
(Address of Surety's Home Office)

\_\_\_\_\_  
(Resident Agent of Surety)

## PERFORMANCE BOND

**KNOW ALL MEN BY THESE PRESENTS** [insert name contractor] (hereinafter called the "Principal") and [insert name of surety] (hereinafter called the "Surety"), are held and firmly bound unto **FULTON COUNTY**, a political subdivision of the State of Georgia (hereinafter called the "Owner") and their successors and assigns, the penal sum of [100% of contract amount], lawful money of the United States of America, for the payment of which the principal and the Surety bind themselves, their administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

**WHEREAS**, the Principal has entered, or is about to enter, into a certain written contract (Contract) with the Owner, dated \_\_\_\_\_, which is incorporated herein by reference in its entirety, for the [name of project], more particularly described in the Contract (herein called the "Project"); and

**NOW, THEREFORE**, the conditions of this obligation are as follows, that if the Principal shall fully and completely perform all the undertakings, covenants, terms, conditions, warranties, and guarantees contained in the Contract, including all modifications, amendments, changes, deletions, additions, and alterations thereto that may hereafter be made, then this obligation shall be void; otherwise it shall remain in full force and effect.

Whenever the Principal shall be, and declared by the Owner to be, in default under the Construction-Type Contract, the Surety shall promptly remedy the default as follows:

1. Complete the Contract in accordance with its terms and conditions; or, at the sole option of the Owner,
2. Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by the Surety and the Owner of the lowest responsible bidder, arrange for a contract between such bidder and Owner and make available as the work progresses (even though there should be a default or succession of defaults under the Contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the penal sum set forth in the first paragraph hereof, as may be adjusted, and the Surety shall make available and pay to the Owner the funds required by this Paragraph prior to the payment of the Owner of the balance of the contract price, or any portion thereof. The term "balance of the contract price," as used in this paragraph, shall mean the total amount payable by the Owner to the Contractor under the Contract, and any amendments thereto, less the amount paid by the Owner to the Contractor; or, at the sole option of the Owner,
3. Allow Owner to complete the work and reimburse the Owner for all reasonable costs incurred in completing the work.

In addition to performing as required in the above paragraphs, the Surety shall indemnify and hold harmless the Owner from any and all losses, liability and damages, claims, judgments, liens, costs and fees of every description, including reasonable attorney's fees, litigation costs and expert witness fees, which the Owner may incur, sustain or suffer by reason of the failure or default on the part of the Principal in the performance of any or all of the terms, provisions, and requirements of the Contract, including any and all amendments and modifications thereto, or incurred by the Owner in making good any such failure of performance on the part of the Principal.

The Surety shall commence performance of its obligations and undertakings under this Bond promptly and without delay, after written notice from the Owner to the Surety.

The Surety hereby waives notice of any and all modifications, omissions, additions, changes, alterations, extensions of time, changes in payment terms, and any other amendments in or about the Contract, and agrees that the obligations undertaken by this Bond shall not be impaired in any manner by reason of any such modifications, omissions, additions, changes, alterations, extensions of time, change in payment terms, and amendments.

The Surety hereby agrees that this Bond shall be deemed amended automatically and immediately, without formal or separate amendments hereto, upon any amendment to the Contract, so as to bind the Principal and the Surety to the full and faithful performance of the Contract as so amended or modified, and so as to increase the penal sum to the adjusted Contract Price of the Contract.

No right of action shall accrue on this Bond to or for the use of any person, entity or corporation other than the Owner and any other obligee named herein, or their executors, administrators, successors or assigns.

This Bond is intended to comply with O.C.G.A. Section 36-91-1 et seq., and shall be interpreted so; as to comply with; the minimum requirements thereof. However, in the event the express language of this Bond extends protection to; the Owner beyond that contemplated by O.C.G.A. Section 36-91-1 et seq. and O.C.G.A. Section 13-10-1, as amended, or any other statutory law applicable to this Project, then the additional protection shall be enforced in favor of the Owner, whether or not such protection is found in the applicable statutes.

**IN WITNESS WHEREOF** the undersigned have caused this instrument to be executed and their respective corporate seals to be affixed and attested by their duly authorized representatives this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_(SEAL)  
(Principal)

By:

Attest:

Secretary

\_\_\_\_\_(SEAL)  
(Surety)

By:

Attest:

Secretary

\_\_\_\_\_  
(Address of Surety's Home Office)

\_\_\_\_\_  
(Resident Agent of Surety)



SECTION 00 850 – LIST OF DRAWINGS

CONTRACT DRAWINGS

The following drawings are bound separately and are part of the Request for Proposal documents.

Dwg. No.	Drawing Title	Issue Date	Latest Rev. No.	Revision Date
TO	COVER SHEET	5/08/06		
G1	CIVIL COVER SHEET	5/08/06		
G2	SURVEY – NORTH	5/08/06		
G3	SURVEY – SOUTH	5/08/06		
C1	SITE PLAN	5/08/06		
C1.1	ROAD FRONTAGE SITE PLAN	5/08/06		
C1.2	UTILITY PLAN	5/08/06		
C1.3	ROAD FRONTAGE UTILITY PLAN	5/08/06		
C2	GRADING AND DRAINAGE PLAN	5/08/06		
C2.1	ROAD FRONTAGE GRADING, DRAINAGE, EROSION, SEDIMENTATION AND POLLUTION CONTROL PLAN	5/08/06		
C3	EROSION, SEDIMENTATION AND POLLUTION CONTROL PLAN (PART A)	5/08/06		
C3.1	PHASE 1, EROSION, SEDIMENTATION AND POLLUTION CONTROL PLAN (PART B)	5/08/06		
C3.2	PHASE 2, EROSION, SEDIMENTATION AND POLLUTION CONTROL PLAN (PART B)	5/08/06		
C3.3	PHASE 3, EROSION, SEDIMENTATION AND POLLUTION CONTROL PLAN (PART B)	5/08/06		
C4	TREE PROTECTION PLAN	5/08/06		
C5	STORM SEWER PROFILES & DETAILS	5/08/06		
C6	DETAILS	5/08/06		
C7	DETAILS	5/08/06		
C8	SANITARY SEWER PROFILES & DETAILS	5/08/06		
C9	DETAILS	5/08/06		
C10	DETAILS	5/08/06		
C11	DETAILS	5/08/06		
C12	SITE DISTANCE VERIFICATION	5/08/06		
C13	DETAILS	5/08/06		
L1	LANDSCAPE PLAN	5/08/06		
L1.1	LANDSCAPE DETAILS	5/08/06		
L1.2	STAINED CONCRETE AND CONCEPTUAL IRRIGATION PLAN	5/08/06		
X1	LIFE SAFETY (EXITING) PLAN	5/08/06		
A1	WALL TYPES	5/08/06		
A2	FLOOR PLAN	5/08/06		
A3	COLUMN DETAILS	5/08/06		
A4	COLUMN DETAILS	5/08/06		

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A5	REFLECTED CEILING PLAN	5/08/06
A6	ROOF PLAN	5/08/06
A7	BUILDING SECTIONS	5/08/06
A8	BUILDING ELEVATIONS	5/08/06
A9	BUILDING ELEVATIONS	5/08/06
A10	BRICK PATTERNS ON BLDG. ELEVATIONS	5/08/06
A11	WALL SECTIONS	5/08/06
A12	WALL SECTIONS	5/08/06
A13	WALL SECTIONS	5/08/06
A14	WALL SECTIONS	5/08/06
A15	WALL SECTIONS	5/08/06
A16	WALL SECTIONS	5/08/06
A17	WALL SECTIONS	5/08/06
A18	WALL SECTIONS	5/08/06
A19	WALL SECTIONS	5/08/06
A20	WALL SECTIONS	5/08/06
A21	WALL SECTIONS	5/08/06
A22	WALL SECTIONS	5/08/06
A23	WALL SECTIONS	5/08/06
A24	ENLARGED LOBBY PLAN & LOBBY WALL ELEVATION	5/08/06
A25	LOBBY ELEVATIONS & DETAILS	5/08/06
A26	ENLARGED GALLERY PLAN & ELEVATIONS	5/08/06
A27	ENLARGED CONCESSIONS / OFFICE PLAN & ELEVATIONS	5/08/06
A28	CONCESSION / COAT CHECK / OFFICE ELEVATIONS & DETAILS	5/08/06
A29	ENLARGED RESTROOM PLAN	5/08/06
A30	ENLARGED DRESSING ROOM PLAN	5/08/06
A31	ENLARGED GREEN ROOM PLAN	5/08/06
A32	SEATING LAYOUT & ELEVATIONS	5/08/06
A33	THEATER ELEVATIONS & DETAILS	5/08/06
A34	THEATER ELEVATIONS & DETAILS	5/08/06
A35	LIGHTING & LOADING GALLERY PLAN & DETAILS	5/08/06
A36	RAMP AND CANOPY PLAN	5/08/06
A37	PROPOSED SCENE SHOP LAYOUT	5/08/06
A38	DOOR SCHEDULE	5/08/06
F-1	FINISH PLAN	5/08/06
F-2A	FINISH SCHEDULE	5/08/06
F-2B	FINISH SCHEDULE	5/08/06
F-3	LOBBY ELEVATIONS	5/08/06
F-4	CONDIMENTS / CONCESSION ELEVATIONS	5/08/06
F-5	MISCELLANEOUS FINISH DETAILS	5/08/06
F-6	THEATER	5/08/06
F-7	THEATER	5/08/06
F-8	RESTROOM ELEVATIONS	5/08/06
F-9	RESTROOM TILE DETAILS	5/08/06
F-10	PREP ROOM ELEVATIONS	5/08/06
F-11	STAR ROOM / DRESSING ELEVATIONS	5/08/06
F-12	FURNITURE PLAN	5/08/06
F-13	VCT PATTERN DETAILS	5/08/06
TH0.0	DRAWING INDEX	5/08/06
TH1.0	STAGE PLAN	5/08/06

Dwg. No.	Drawing Title	Issue Date	Latest Rev. No.	Revision Date
TH1.1	AUDITORIUM SECTION	5/08/06		
TH2.0	DRAPERY ELEVATIONS	5/08/06		
TH3.0	RIGGING ELEVATION	5/08/06		
TH4.0	TYPICAL BATTENS	5/08/06		
TH5.0	<b>NOT USED</b>			
TH6.0	<b>NOT USED</b>			
TH7.0	RIGGING DETAILS	5/08/06		
TH8.0	PERFORMANCE LIGHTING RISER & SCHEDULE	5/08/06		
TH9.0	DMX RISER	5/08/06		
TH10.0	F.O.H DISTRIBUTION PLAN	5/08/06		
TH10.1	F.O.H DISTRIBUTION DETAILS	5/08/06		
TH11.0	PLAN OF STAGE ELECTRICS	5/08/06		
TH11.1	STAGE ELECTRICS DETAILS	5/08/06		
TH12.0	FLOOR POCKET PLAN	5/08/06		
TH12.1	FLOOR POCKET DETAILS	5/08/06		
AV0.1	AUDIO INDEX AND SYMBOL LIST	5/08/06		
AV1.0	POWER AND GROUNDING DETAIL	5/08/06		
AV2.1	DEVICE LOCATIONS: 1 <sup>ST</sup> FLOOR AND MEZZANINE	5/08/06		
AV2.2	DEVICE LOCATIONS: PERFORMANCE HALL GALLERY LEVEL	5/08/06		
AV2.3	CEILING SPEAKER LOCATIONS	5/08/06		
AV3.1	AUDITORIUM AUDIO SYSTEM FUNCTIONAL DIAGRAM	5/08/06		
AV3.2	VIDEO AND GALLERY SYSTEM DIAGRAMS	5/08/06		
AV3.3	PRODUCTION COMMUNICATION SYSTEM DIAGRAM	5/08/06		
AV4.1	PLATE DETAILS	5/08/06		
AV4.2	RACK ELEVATIONS	5/08/06		
AV5.1	SPEAKER AIMING DETAILS	5/08/06		
S0.1	GENERAL NOTES, LEGEND, AND ABBREVIATIONS	5/08/06		
S0.2	TYPICAL SECTIONS AND DETAILS	5/08/06		
S0.3	TYPICAL SECTIONS AND DETAILS	5/08/06		
S1.1	FOUNDATION AND FLOOR PLAN	5/08/06		
S1.2	ROOF FRAMING PLAN	5/08/06		
S3.1	SECTIONS AND DETAILS	5/08/06		
S3.2	SECTIONS AND DETAILS	5/08/06		
S3.3	SECTIONS AND DETAILS	5/08/06		
S3.4	SECTIONS AND DETAILS	5/08/06		
M0	HVAC SCHEDULES	5/08/06		
M1	FLOOR PLAN – HVAC	5/08/06		
M2	ROOF PLAN – HVAC	5/08/06		
M3	ENLARGED PLANS – HVAC	5/08/06		
M4	HVAC DETAILS AND NOTES	5/08/06		
M5	HVAC DETAILS	5/08/06		
M0A	HVAC SCHEDULES - ALTERNATE	5/08/06		
M1A	FLOOR PLAN – HVAC - ALTERNATE	5/08/06		
M2A	ROOF PLAN – HVAC - ALTERNATE	5/08/06		
M3A	ENLARGED PLANS – HVAC - ALTERNATE	5/08/06		
M4A	HVAC DETAILS AND NOTES - ALTERNATE	5/08/06		
M5A	HVAC DETAILS - ALTERNATE	5/08/06		

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Dwg. No.	Drawing Title	Issue Date	Latest Rev. No.	Revision Date
E1a	LEGEND, FIXTURE SCHEDULE AND DETAILS	5/08/06		
E1b	ELECTRICAL PANEL SCHEDULES	5/08/06		
E1c	ELECTRICAL SITE LIGHTING PLAN	5/08/06		
E2	FLOOR PLAN – ELECTRICAL	5/08/06		
E3	FLOOR PLAN – LIGHTING	5/08/06		
E4	FLOOR PLAN – SYSTEMS	5/08/06		
E1aA	LEGEND, FIXTURE SCHEDULE AND DETAILS - ALTERNATE	5/08/06		
E1bA	ELECTRICAL PANEL SCHEDULES - ALTERNATE	5/08/06		
E1cA	ELECTRICAL SITE LIGHTING PLAN - ALTERNATE	5/08/06		
E2A	FLOOR PLAN – ELECTRICAL - ALTERNATE	5/08/06		
E3A	FLOOR PLAN – LIGHTING - ALTERNATE	5/08/06		
E4A	FLOOR PLAN – SYSTEMS - ALTERNATE	5/08/06		
P-1	SCHEDULES, NOTES, AND DETAILS – PLUMBING	5/08/06		
P-2	OVERALL FLOOR PLAN LAYOUT – PLUMBING	5/08/06		
P-3	ENLARGED FLOOR PLAN LAYOUT – PLUMBING	5/08/06		
P-4	ISOMETRICS – PLUMBING	5/08/06		
P-1A	SCHEDULES, NOTES, AND DETAILS – PLUMBING - ALTERNATE	5/08/06		
P-2A	OVERALL FLOOR PLAN LAYOUT – PLUMBING - ALTERNATE	5/08/06		
P-3A	ENLARGED FLOOR PLAN LAYOUT – PLUMBING - ALTERNATE	5/08/06		
P-4A	ISOMETRICS – PLUMBING - ALTERNATE	5/08/06		

**END OF SECTION 00 850, LIST OF DRAWINGS**

## SECTION 01 010 – SUMMARY OF WORK

### 1. GENERAL

- A. This Section includes detailed information regarding the scope of work for this Contract. Scopes of work for any separate contracts for the Project, if any, and other information relating to or affecting this Contract shall also be provided in this Section.
- B. The Contractor is responsible for performing the Work described in this Section for the Contract for which it has submitted a bid. The Contractor shall have taken all of the provisions herein into consideration when preparing its bid, and all costs associated with performing all Work required by the Contract Documents shall be included in the Contractor's Contract Sum. The Contractor is responsible for knowing what Work has been assigned to any preceding or succeeding separate contracts. No additional reimbursement or extensions of time will be allowed the Contractor due to its ignorance of the Work assigned to this Contract or to any separate contract which may affect its Work.
- C. The Contract Documents shall be construed so as to require the Contractor to perform all Work reasonably inferable therefrom as being necessary in order to produce the indicated functional, operational or finished result.
- E. The Contract Documents issued are deemed by the County to contain sufficient information for bidding and contracting for the Work specified. However, the Contractor is advised to check documents for thoroughness of information and notify the Construction Manager immediately in writing of any valid discrepancies.
- F. Time is of the essence for every portion of this Contract wherein a definite and certain length of time is fixed for performance of any act whatsoever. The Contractor shall be aware of the extreme importance of performing the Work and achieving all required milestones and completion dates within the allotted Contract Time.

### 2. PROJECT LOCATION

The project site is located at:                      The project site is located at:  
915 New Hope Road  
Atlanta, Georgia 30331

### 3. REGULATORY REQUIREMENTS & STANDARDS

- A. Permitting: The Contractor assumes responsibility for securing all land disturbance permits, demolition permits and building permits; providing meters and paying all utility tie-in fees; restoring

of roads and right-of-ways; maintaining siltation control; and securing all final releases from regulating bodies. Minimum permits required for this Project:

- (1) Land Disturbance Permit: from Fulton County Development Services Department.
- (2) Building Permit from Fulton County Development Services Department

The Contractor is responsible for payment of fees associated with the permits and inspections per the following schedule. ANY FEE FOR REQUIRED PERMITS OR INSPECTIONS NOT SPECIFICALLY NOTED BELOW AS WAIVED IS THE RESPONSIBILITY OF THE DESIGN/BUILDER.

- a. Land Disturbance Permitting-Fee Waived
- b. Fulton County Building Permit-Fee Waived
- c. ARC Review -Fee Waived
- d. Road Inspection-Fee Waived
- e. Curb and Gutter-Fee Waived
- f. Base/Paving-Fee Waived
- g. Commercial Driveway-Fee Waived
- h. Storm Drainage-Fee Waived
- i. Wastewater-Fee Waived
- j. Water Main-Fee Waived
- k. Erosion Control-Fee Waived
- l. Landscape-Fee Waived
- m. Street Name Markers-Not Waived
- n. Traffic Signs-Not Waived
- o. Microfilming-Not Waived
- p. Wastewater Use Fee-Not Waived
- q. Water & Wastewater Tap Fee-Not Waived
- r. Tree Harvest Permit-Not Waived
- s. Health Department-various fees at the discretion of the Health Department

- B. Codes: It is the Contractor's responsibility to comply with all applicable laws, statutes, ordinances, building codes, rules and regulations applicable to the Work.

#### **4. PROJECT DESCRIPTION & SUMMARY SCOPE OF SERVICES**

- A. The Project is an approximately 23,300 square foot performing arts facility to serve the Southwest Fulton County Citizens. The site is wooded and is collocated with an existing Fulton County SW Arts Center educational facility. The building is conventional construction consisting of a slab on grade, light structural framing, brick exterior, and a standing seam roof.

- B. The Contractor's services shall include all construction and furnishings and equipment installation required to complete the Work as indicated in the Contract Documents. The Contractor shall provide or cause to be provided and shall pay for all testing services, labor, materials, equipment, tools, construction equipment and machinery, temporary utilities, transportation and all other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent, and whether or not incorporated or to be incorporated in the Work. The above shall be provided such that the facility is turned over to the County in a complete, finished, and fully functional and operating manner.

## **5. SCOPE OF WORK**

- A. Work includes, but is not limited to, construction for sitework, demolition, fencing and gates, paving, landscaping, foundations, retaining walls (if required), concrete slabs, substructure, superstructure, exterior envelope, waterproofing, sealants, insulation, railings, millwork, doors, door frames, finish hardware, interior walls and ceilings, interior finishes, toilet partitions and accessories, furnishings (including window blinds), equipment, signage, elevators, plumbing, HVAC, energy management and control system, electrical, lighting, telecommunications, and electronic fire alarm and security systems.
- B. The Contractor shall be responsible for securing and paying for all permits, fees, taps, meters, inspections and bonds required to complete the Work. The Contractor shall also be responsible for paying for and coordinating all the required Work with all utility companies required for services to the Project. Additionally, any disruption in service must be coordinated to the satisfaction of the Owner so as not to disrupt any ongoing activities and requirements of the Owner.

**End of Section 01 010 Summary of Work**



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SECTION 01 020 - ALLOWANCES

1. DEFINITIONS / GENERAL

- A. Allowances: Allowances are defined as sums of monies within the Contract Sum which may, at Owner's option and under terms established in the Contract, be utilized at the Owner's discretion to supplement corresponding basic requirements of Contract Documents.
- B. Owner allowances are exclusively for the cost of materials, delivery to the site and associated installation. The total allowance amount is exclusively for Owner use, and shall include no markup for the Contractor or for its subcontractors.

2. SCHEDULE OF ALLOWANCES

A. OWNER-PROVIDED ALLOWANCES

1. Division 02 Owners Sitework Allowance

- a. Allowance amount: \$150,000.00
- b. Scope of Work: As determined by the Owner, through the Construction Manager.
- c. Procurement Procedure: By the Contractor, and coordinated by the Construction Manager.
- d. Schedule Conditions: As required.
- e. Coordination Responsibility: As determined by the Construction Manager.

2. Div. 11 Owner's Equipment

- a. Allowance Amount: \$ 43,000.00
- b. Scope of Work: Furnish and place loose equipment (non-hardwired) as selected by the Owner.
- c. Procurement Procedures: Selected by the Owner, procured by the Contractor, and coordinated by the Construction Manager.
- d. Schedule Conditions: Contractor to schedule procurement, ordering, and placement. The scheduling of these activities shall be incorporated into the Contractors detailed schedule.
- e. Coordination Responsibilities: Contractor shall be responsible for coordinating the vendor or subcontractor performing the allowance work.

3. Div. 10 Owner's Signage

- a. Allowance Amount: \$ 10,000.00
- b. Scope of Work: Furnish and place interior door, room, specialty and building signage as directed by the Owner. Modify, relocate and/or replace existing site signage and associated lighting.
- c. Procurement Procedures: Selected by the Owner, procured by the Contractor, and coordinated by the Construction Manager.
- d. Schedule Conditions: Contractor to schedule procurement, modification and/or relocation, and installation. The scheduling of these activities shall be incorporated into the Contractor's detailed schedule.
- e. Coordination Responsibilities: Contractor shall be responsible for coordinating the vendor or subcontractor performing the allowance work.

4. Div. 01 Owner's Allowance

- a. Allowance Amount: \$ 150,000.00
- b. Scope of Work: As determined by the Owner, through the Construction Manager.
- c. Procurement Procedure: Selected by the Owner, procured by the Contractor, and coordinated by the Construction Manager.
- d. Schedule Conditions: As required.
- e. Coordination Responsibility: As determined by the Construction Manager.

5. Div. 12 Theatre Seating Allowance

- a. Allowance Amount: \$ 100,000.00
- b. Scope of Work: Furnish and install theatre seating as selected by the Owner, and as specified in Section 12 200
- c. Procurement Procedure: Selected by the Owner, procured by the Contractor, and coordinated by the Construction Manager.

- d. Schedule Conditions: As required.
- e. Coordination Responsibility: Contractor shall be responsible for coordinating the vendor or subcontractor performing the allowance work.

END OF SECTION 01 020, ALLOWANCES



## SECTION 01 025 - APPLICATIONS FOR PAYMENT

### 1. SUBMITTAL OF APPLICATION FOR PAYMENT

The County will make payments to the Contractor on the basis of a duly certified and approved estimate of the Work completed through the 25th day of each calendar month, as reviewed by the Construction Manager, provided the estimate was submitted in accordance with the following requirements:

- A. The Applications for Payment shall be itemized as directed by the Construction Manager. Applications for Payment are to serve as certification by the Contractor as to the status of the Work.
- B. On or prior to the 20th day of each month, the Contractor will prepare a preliminary, itemized Application for Payment for work completed and the value of any stored materials, projected through the 25th of the current month, as well as additional information required herein or as the County and Construction Manager may require to verify and approve the amount of payment applied for. The Contractor may be requested to review the Application for Payment with the Construction Manager on the jobsite in order to verify work in place or the location of stored materials. A copy will also be transmitted to the Architect for its review and recommendations.
- C. After the Construction Manager has advised the Contractor of the acceptability of the Application for Payment, and on or before the 25th day of each month, the Contractor shall submit to the Construction Manager an itemized, notarized Application for Payment. The Contractor shall also submit, if requested, additional documentation, including, but not limited to, all sworn statements, waivers and releases of liens and claims, including those required of subcontractors of any tier as may be requested by the Construction Manager, reflecting all retainage, previous Applications for Payment, payment for labor and material, payment for materials stored and other documentation and requirements related to Work performed as provided elsewhere in the Contract Documents or as required by the Construction Manager.
- D. Late applications will not be accepted for any reason whatsoever. If the Contractor is late with its pay application, it will not be processed until the next pay cycle.
- E. The Contractor shall submit the Application for Payment in four (4) hardcopies on the latest version of *AIA Document G702/CMA, Application and Certificate for Payment – Construction Manager-Advisor Edition* and *AIA Document G703, Continuation Sheet for G702*, and each copy shall display an original signature by a duly authorized agent of the Contractor. The application may be generated by the use of a software applications package acceptable to the Construction Manager, and provided that the forms generated are in the format of the standard AIA Documents indicated above. All four copies shall be individually notarized.
- F. The Contractor shall submit Interim Waiver and Release Upon Progress Payment and an Unconditional Waiver and Release Upon Final Payment when submitting the Application for Payment. Appendix B, is to be used for Progress Payments. Appendix C or the *AIA Document G706A, Contractor's Affidavit of Release of Liens*, latest version, is to be used for Final Payment.

- G. The Owner will withhold ten (10) percent of each payment until the Contractor's contracted Work is fifty (50) percent complete. If the Contractor's performance is satisfactory, and if the Contractor is on schedule, then further retainage will cease to be withheld. If at any later date, the Construction Manager determines that the Contractor's progress is unsatisfactory in any manner, the Construction Manager may reinstate the entire ten (10) percent withholding on the sum of all of the payments made to that date. The Construction Manager shall be the sole determining party with regards to the reinstatement of the entire ten (10) percent retainage. No appeal from the Contractor will be entertained. Retainage release upon Substantial Completion shall be per O.C.G.A. 13-10-2.
- H. At no time during the contract will the Contractor be allowed to bill for an amount which is in excess of the amount of its contract, including all signed and executed change orders.

## 2. PAYMENT FOR MATERIALS STORED ON SITE

- A. As provided in the Contract Documents, payments will be made on account of materials or equipment not incorporated in the Work, but delivered and suitably stored at the site, provided such materials are stored according to the provisions of the Contract Documents and the satisfaction of the Construction Manager. Provisions for storing materials at the site are described elsewhere in the General Requirements.
- B. The Contractor shall include with his payment request an itemization of the quantity of such materials, and shall document with invoices, Bills of Sale or other documentation acceptable to the Construction Manager, the cost of said materials.

## 3. PAYMENT FOR MATERIALS STORED OFF SITE

Payment for materials stored at a location off the project site will be made only if the following requirements are fully met:

- A. Materials to be stored away from the project site must be fully fabricated, identified by paint stencil or other permanent marking device, to be the property of Fulton County, for the Project, and not readily usable on another project (i.e., not of a raw or stock materials nature).
- B. The Contractor must submit a written request to the Construction Manager, no later than the 10th of the month of the Application for Payment, to be allowed to request payment for materials stored off the project site.
- C. Upon obtaining the Construction Manager's approval, each Contractor making a request for payment for materials stored off-site shall comply with the following, prior to making application for payment for materials stored off site:
1. Execute a Bill of Sale of Personal Property including all attachments, using the form provided in Appendix A to this section. No exceptions or substitutions of other forms are to be made.

2. Submit evidence that the materials have been fully paid for by the Contractor or subcontractor. Typically, this should be in the form of a receipted invoice from the supplier describing the material exactly as listed in the Bill of Sale, plus the supplier's corresponding waiver of lien.
  3. Provide evidence of insurance coverage on the stored materials. Note that this requires the Contractor to furnish the County with a loss payable clause endorsement to its insurance policy providing for payment to the County in the event of a loss.
  4. The Contractor must submit a written statement from its Surety consenting to the payment for the materials stored off-site.
  5. A certification shall be submitted from the Contractor certifying that he has actually visited the location where the materials are stored and has verified the quantity of materials so stored, that they are being safely stored, and that they are physically and clearly identified as being the property of the County. (This requirement may be waived only at the sole discretion of the County.)
  6. Until such time that all off-site stored materials for which the Contractor or subcontractor has requested payment have been delivered to the job site, the Contractor shall submit with each succeeding payment request, a notarized certificate to the County certifying as to the quantity and value of the stored materials, if any, which have been delivered to the project site, and the quantity and value of materials still being stored at the off-site location, as of the date applicable to the application.
  7. All payments for materials stored off-site will be made net of retention as provided for in the Contract Documents. Under no circumstances will such retention for stored materials be reduced regardless of the percentage or completion of the Contractor's or subcontractor's Work.
- D. The Construction Manager shall be notified by the Contractor when the materials are to be transferred to the project site and when the materials are received at the project site.

#### 4. PROGRESS PAYMENTS

- A. If the Contractor has made Application for Payment as detailed herein, the Construction Manager will confirm the amounts to be paid to the Contractor, certify each copy by original signature, retain one signed copy for its project files, and transmit the remaining copies as Certification for Payment to the County.
- B. The Contractor may expect payment from the County within thirty (30) days of the Contractor's submittal of an Application for Payment per Paragraph 1.0 of this Section. Any follow-up inquiries on the status of payments shall be through the Construction Manager. The Contractor is not permitted to contact the County directly with any payment inquiries.

- C. No approval of any application for progress payment, nor any progress payment, nor any partial or entire use of occupancy of the Work or the Project by the County, shall constitute an acceptance of any Work not in accordance with the Contract Documents.

**END OF SECTION 00 125, APPLICATIONS FOR PAYMENT**

APPENDIX A - PAGE 1 OF 3

BILL OF SALE OF PERSONAL PROPERTY

KNOW ALL MEN BY THESE PRESENTS,

THAT,

For and in consideration of the sum of

\_\_\_\_\_ Dollars (\$ \_\_\_\_\_)

and other good and valuable consideration, the receipt of which is hereby acknowledged, \_\_\_\_\_, the Undersigned ("Seller"), does by these presents BARGAIN AND SELL UNTO FULTON COUNTY, GEORGIA ("Purchaser") the goods and chattels located at \_\_\_\_\_ as described on the Schedule attached hereto and by this reference made a part hereof (the "Property").

IN CONSIDERATION OF THE FOREGOING AND THE COVENANTS HEREIN CONTAINED, SELLER AGREES AS FOLLOWS:

1. Seller does hereby covenant and warrant to the Purchaser that Seller is the lawful owner of the Property; that the Property is free from all liens and claims whatsoever; that Seller has good right to sell the same; that Seller will warrant and defend same against the claims and demands of all persons.
2. Seller will provide safe and proper storage for the Property and will cause to be placed conspicuously and securely on the Property a sign or signs, which will show that the Property is the Property of the Purchaser.
3. The Property shall be held at Seller's risk, and shall be kept insured, against fire, theft, and all other hazards by Seller at Seller's expense while in its custody or control in an amount equal to the replacement cost thereof, with loss payable to Purchaser. Copies of policies or certificates of such insurance will be furnished to Purchaser.
4. Seller shall indemnify, defend, and hold the Purchaser harmless from and against claims, liabilities, damages, suits, actions, losses, costs or expenses, including reasonable attorneys' fees, arising out of or occasioned by the loss, theft, damage, destruction handling, repair and maintenance of the Property or any part thereof.
5. The Purchaser or his agents shall have the right to inspect the Property at any time during normal business hours at the storage facilities of the Seller. The failure to inspect shall not be deemed a waiver of any of the rights of the Purchaser, and, if the Property is found to be defective, in material or workmanship, stolen or lost, in whole or in part, the Seller shall replace the same at its own cost.
6. The Property shall be subject to removal by Purchaser, at any time, upon Purchaser's instruction.

IN WITNESS WHEREOF, the Undersigned has set hand this \_\_\_\_\_ day of \_\_\_\_\_, 2006.

SELLER:

\_\_\_\_\_

APPENDIX A - PAGE 2 OF 3

BILL OF SALE OF PERSONAL PROPERTY

ATTEST:

\_\_\_\_\_

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

This is to certify that \_\_\_\_\_ is personally known to me to be the same person whose name subscribed on the foregoing bill of sale appeared before me, \_\_\_\_\_, a notary public, this \_\_\_\_\_ day of \_\_\_\_\_, 2005, and expressly acknowledged to me the execution of said foregoing bill of sale a free and voluntary act, receipt of consideration as recited therein, and that \_\_\_\_\_ understood the foregoing bill of sale and intended to be legally bound by the same.

NOTARY PUBLIC:

\_\_\_\_\_

My Commission expires on:

\_\_\_\_\_

APPENDIX A - PAGE 3 OF 3

BILL OF SALE OF PERSONAL PROPERTY

Schedule of Stored Materials

This Schedule is an attachment to the Bill of Sale of Personal Property dated \_\_\_\_\_.

CONTRACTOR'S CERTIFICATE OF QUANTITY AND VALUE OF STORED MATERIAL

This is to certify that the stored materials intended for installation on the \_\_\_\_\_ (Project Site), for which the Contractor or Vendor (Seller) has requested payment tabulated in Column "F" of the Contractor's Application for Payment dated \_\_\_\_\_, and as conveyed by the aforementioned Bill of Sale of Personal Property, are comprised of the items or bulk quantities of goods insured as certified by the attached loss payable clause endorsement to the Seller's insurance policy, as provided by the attached written consent of Surety, and as set forth below in numbered Sections 1 and 2.

This attachment further certifies that, of the items or quantities of materials previously conveyed by Bill(s) of Sale provided prior to the date of the aforementioned Bill of Sale to which this is an attachment, and previously stored at locations other than the Project Site, only the following items or bulk quantities, as set forth in numbered Section 3 below, remain so stored:

**Section 1 - MATERIALS PERTAINING TO THE AFOREMENTIONED BILL OF SALE AND STORED AT LOCATIONS OTHER THAN THE CONSTRUCTION PROJECT SITE:**

Quantity	Description	Value (before retainage)	Storage Location

SUBTOTAL BEFORE RETAINAGE: \_\_\_\_\_

APPENDIX B - PAGE 1 OF 2

Waiver and Release of Lien Upon Progress Payment

PROJECT \_\_\_\_\_

GENERAL CONTRACTOR \_\_\_\_\_

STATE OF GEORGIA  
FULTON COUNTY

The undersigned, in consideration of the sum of \$ \_\_\_\_\_, hereby waives and releases its  
lien and right to claim a lien for labor, services, or materials furnished through \_\_\_\_\_  
(date of this waiver) under contract with Fulton County (Owner) for the following Property:

\_\_\_\_\_ (Project Name)

\_\_\_\_\_ (Project Address).

This waiver and release does not cover any retention or labor, services or materials furnished after the date specified.

Any and all contractors, subcontractors, laborers, suppliers and materialmen that have provided labor, material or  
services to the undersigned for use or incorporation into the construction of the improvements to the Property have  
been paid and satisfied in full, and there are no outstanding claims of any character arising out of, or related to, the  
undersigned's activities on, or improvement to the Property.

This waiver constitutes a representation by the undersigned signatory, for and on behalf of the firm or company listed  
below, that the payment referenced above, once received, constitutes full and complete payment for all work  
performed, and all cost or expenses incurred (including, but not limited to, costs for supervision, field office overhead,  
home office overhead, interest on capital, profit, and general conditions costs) relative to the work or improvements at  
the Property as of the date of this Waiver, except for the payment of retainage. The undersigned hereby specifically  
waives, quitclaims and releases any claim for damages due to delay, hindrance, interference, acceleration,  
inefficiencies or extra work, or any other claim of any kind it may have against the Owner, the Tenant, the General  
Contractor (if this Waiver is signed by a subcontractor or supplier), or any other person or entity with a legal or  
equitable interest in the Property, as the date of this Waiver, except as follows:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

This Waiver is specifically made for the benefit of the Owner and any other person or entity with a legal or equitable  
interest in the Property. The amount of money set forth as due and owing in the immediately preceding Waiver dated  
\_\_\_\_\_, 2006, has been received, and is deemed paid in full.

In Witness Whereof, the undersigned signatory, acting for and on behalf of the firm of company listed below and all of its laborers, subcontractors, and suppliers, has placed his hand and seal this \_\_\_\_\_ day of \_\_\_\_\_, 2006.

FIRM OR COMPANY:

Sworn to and subscribed  
Before me this \_\_\_\_\_ day of \_\_\_\_\_, 2006

\_\_\_\_\_

\_\_\_\_\_  
Notary Public

By: \_\_\_\_\_  
*signature*

\_\_\_\_\_  
*print name*

(NOTARY SEAL)

Its: \_\_\_\_\_

My Commission Expires:

\_\_\_\_\_

APPENDIX C - PAGE 1 OF 1

Waiver and Release of Lien Upon Final Payment

PROJECT \_\_\_\_\_

GENERAL CONTRACTOR \_\_\_\_\_

STATE OF GEORGIA  
FULTON COUNTY

The undersigned, in consideration of final payment in the amount of \$ \_\_\_\_\_, hereby waives and releases its lien and right to claim a lien for labor, services, or materials furnished to Fulton County on the project \_\_\_\_\_ . (Name and Address of Project)

Any and all contractors, subcontractors, laborers, suppliers and materialmen that have provided labor, material or services to the undersigned for use or incorporation into the construction of the improvements to the Property have been paid and satisfied in full, and there are no outstanding claims of any character arising out of, or related to, the undersigned's activities on, or improvement to the Property. This Waiver is specifically made for the benefit of Owner, any tenant and lender of any tenant, and any other person or entity with a legal or equitable interest in the Property.

This waiver constitutes a representation by the undersigned signatory, for and on behalf of the undersigned, that the payment referenced above, once received, constitutes full and complete payment for all work performed, and all cost or expenses incurred (including, but not limited to, costs for supervision, field office overhead, home office overhead, interest on capital, profit, and general conditions costs) relative to the work or improvements at the Property. The undersigned hereby specifically waives, quitclaims and releases any claim for damages due to delay, hindrance, interference, acceleration, inefficiencies or extra work, or any other claim of any kind it may have against the Owner, the General Contractor (if this Waiver is signed by a subcontractor or supplier), or any other person or entity with a legal or equitable interest in the Property, relative to the work or improvement at the Property.

In Witness Whereof, the undersigned signatory, acting for and on behalf of the firm of company listed below and all of its laborers, subcontractors, and suppliers, has placed his hand and seal this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

FIRM OR COMPANY:

Sworn to and subscribed  
Before me this \_\_\_\_\_ day of \_\_\_\_\_, 2006 \_\_\_\_\_

\_\_\_\_\_  
Notary Public

By: \_\_\_\_\_  
*signature*

\_\_\_\_\_  
*print name*

(NOTARY SEAL)

Its: \_\_\_\_\_

My Commission Expires:  
\_\_\_\_\_

## SECTION 01 027 – UNIT PRICES

### 1. DEFINITIONS, STANDARDS AND SUBMITTALS

- A. The Unit Prices listed and described below have been established and shall include the following:
1. The furnishing of all management, supervision, submittals, installation, start-up and service labor, materials, tools, equipment, overhead and profit.
  2. Complete coordination of the work in each Unit Price's scope of work with the work of all other trades, regardless of whether these trades are in the employment of the Contractor, a separate contractor, or of the County or the Construction Manager.
  3. All appropriate corresponding additions or deductions for materials being replaced or modifications to the structure which must be made as a result of the addition or deletion of the item(s) covered by each Unit Price.
  4. Although such work may not be specifically indicated, the furnishing and installation of all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
  5. If incorporated into the project, each Unit Price shall be considered to be subject to all terms and conditions of the Contract, including, but not necessarily limited to the Owner-Contractor Agreement, all Sections of the General Requirements, and all applicable Sections of the Technical Specifications.
- B. Quality Assurance: See individual Specification Sections and the Contract Drawings for required standards.
- C. Submittals: See individual Specification Sections and the Contract Drawings for required submittals.

### 2. ACCEPTANCE AND INCORPORATION OF UNIT PRICES

- A. The County reserves the right to accept or reject any and/or all of the Unit Prices. Unit Prices shall remain valid for a period of ninety (90) days from the date of bid. Unit Prices may be awarded after award of the Base Contract, and if so, shall be incorporated into the Contract by change order.
- B. The Contractor agrees that if the quantities of work change from the estimated quantities provided herein, the Contract Sum will be adjusted by an amount equal to the net difference of quantities multiplied by the agreed upon Unit Price. The Unit Price for additions to the estimated quantity shall be the same as that for deductions.
- C. The Contractor is advised that the quantities used for the basis of the Unit Prices are estimated and the actual quantities may vary significantly from the estimates. Unit Prices shall not be adjusted regardless of the difference between the actual and estimated quantities.
- D. The calculations for determining the number of actual units of work shall be based on actual surface area, volume, length, hours, or number of individual items, per the Unit Price descriptions, complete in place and accepted or omitted. No additional quantities or costs for waste, loss, breakage, or damage will be allowed.

### 3. DESCRIPTION OF UNIT PRICES

- A. Unit Price No. 1: Rock Removal & Off-Site Disposal, per cubic yard.

Definition of Rock: Any material which cannot be excavated with a single-tooth ripper drawn by a crawler tractor having a minimum draw bar pull rated at not less than 56,000 pounds (comparable to Caterpillar D 8K or Caterpillar 977 front-end loader), and occupying an original volume of at least one cubic yard. The Construction Manager shall be the sole determiner as to the limits to which the material is classified as rock.

Note: There is no estimated quantity for this work item. The proposed unit price, if accepted by the County, will be applied to actual quantities in the event the work described above is required. **The Base Bid is not to contain any dollars for the above described scope of work.**

B. Unit Price No. 2: Unsuitable Soil Removal & Off-Site Disposal, per cubic yard.

Definition of Unsuitable Soil: Any material, in the opinion of the Engineer of Record (subject to the review of the Construction Manager), which is unsuitable for foundation, shall be removed and replaced with crushed stone, or with compacted fill material as directed by the Engineer of Record. No determination of unsuitability will be made until all requirements for dewatering are satisfactorily met.

Note: There is no estimated quantity for this work item. The proposed unit price, if accepted by the County, will be applied to actual quantities in the event the work described above is required and could not have been expected or reasonably anticipated from the preliminary geotechnical report or other information provided in the Contract Documents. **The Base Bid is not to contain any dollars for the above described scope of work.**

C. Unit Price No. 3: Importing soil suitable for structural backfilling, per cubic yard.

Definition of soil suitable for structural backfilling: All fill material shall be soil exclusive of organic matter, frozen lumps or other deleterious substances. It shall contain no rocks or lumps over 3-inches maximum in dimension.

Note: There is no estimated quantity for this work item. **This unit price shall only apply to suitable soil required to replace either rock or unsuitable soil removed and paid for utilizing Unit Price Nos. 1 and 2, as described above.** The proposed unit price, if accepted by the County, will be applied to actual quantities in the event the work described above is required and could not have been expected or reasonably anticipated from the preliminary geotechnical report or other information provided in the Contract Documents. **The Base Bid is not to contain any dollars for the above described scope of work.**

D. Unit Price No. 4 – 61: Specified building standard materials, products and finishes as specified in the Unit Price table of the Bid Form, Section 00 300 Bid Form. **The Base Bid is to contain dollars for the quantity of items described scope of work. This unit price shall only apply to the addition or deletion of items as may be required.**

**END OF SECTION 01 027, UNIT PRICES**

## **SECTION 01 030 – BID ALTERNATES**

### **1. DEFINITIONS, STANDARDS AND SUBMITTALS**

- A. The Bid Alternates listed and described below have been established and shall include the following:
1. The furnishing of all management, supervision, installation, start-up and service labor, materials, tools, equipment, overhead and profit.
  2. Complete coordination of the work in each Bid Alternate's scope of work with the work of all other trades, regardless of whether these trades are in the employment of the Contractor, or of the County or Construction Manager.
  3. All appropriate corresponding additions or deductions for materials being replaced or modifications to the structure, which must be made as a result of the addition or deletion of, the item(s) covered by each Bid Alternate.
  4. Although such work may not be specifically indicated, the furnishing and installation of all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
  5. If incorporated into the project, each Bid Alternate shall be considered to be subject to all terms and conditions of the Contract, including, but not necessarily limited to the Owner-Contractor Agreement, all Sections of the General Requirements, and all applicable Sections of the Technical Specifications.
- B. Quality Assurance: See individual Specification Sections for required standards modified to conform to alternate conditions.
- C. Submittals: See individual Specification Sections for required submittals modified to conform to alternate conditions.

### **2. ACCEPTANCE AND INCORPORATION OF BID ALTERNATES**

- A. The County reserves the right to accept or reject any and/or all of the Bid Alternates. Bid Alternates shall remain valid for a period of ninety (90) days from the date of bid. Bid Alternates may be awarded after award of the Base Contract, and if so, shall be incorporated into the Contract by change order.
- B. The price of each Bid Alternative and any combination thereof may be considered in the evaluation for award of any and/or all proposed prices for the Bid Alternates.

### 3. DESCRIPTION OF BID ALTERNATES

- A. Bid Alternate No. 1: delete special brick coursing design at west elevation and related corners and replace with buff color brick (reference elevations 1/A8, 2/A8, 2/A10, 1/A11).
- B. Bid Alternate No. 2: add scored and stained concrete to front plaza (reference drawing L-1.2)
- C. Bid Alternate No.3A – 3L: deduct Theater Seating allowance (reference Section 01 020 Allowances and 12 200 Theatre Seating) and replace with :
- 3A. KI Concerto chair as specified in Section12 200 in COM fabric
  - 3B. KI Concert chair as specified in Section12 200 in manufacturer's Grade 2 fabric
  - 3C. KI Lancaster chair as specified in Section12 200 in COM fabric
  - 3D. KI Lancaster chair as specified in Section12 200 in manufacturer's Grade 2 fabric
  - 3E. American Seating Stellar chair as specified in Section12 200 in COM fabric
  - 3F. American Seating Stellar chair as specified in Section12 200 in manufacturer's Grade 2 fabric
  - 3G. American Seating Stellar chair as specified in Section12 200 in manufacturer's Grade 4 fabric
  - 3H. American Seating Spirit chair as specified in Section12 200 in COM fabric
  - 3I. American Seating Spirit chair as specified in Section12 200 in manufacturer's Grade 2 fabric
  - 3J. American Seating Spirit chair as specified in Section12 200 in manufacturer's Grade 4 fabric
  - 3K. Hussey Quattro chair as specified in Section12 200 in COM fabric
  - 3L. Hussey Quattro chair as specified in Section12 200 in manufacturer's Grade K fabric
  - 3M. Irwin Seating Citation chair as specified in Section12 200 in COM fabric
  - 3N. Irwin Seating Citation chair as specified in Section12 200 in manufacturer's Grade D fabric.
  - 3O. Irwin Seating Marquis chair as specified in Section12 200 in COM fabric
  - 3P. Irwin Seating Marquis chair as specified in Section12 200 in manufacturer's Grade D fabric.

Manufacturer's representatives for Theatre Seating Alternates are:

**KI (Krueger International Inc.)**  
Stephen Rier / District Sales Mgr  
KI - Georgia  
678.461.9876 phone  
678.461.9620 fax  
Stephen.Rier@ki.com

**American Seating**  
Danez Black  
BlackSmith, LTD.  
770.507.9226 x 12 phone  
770.507.9027 fax  
dblack@blacksmithltd.com

**Hussey**  
Beth Hall, Estimator  
Georgia Institutional Furnishings  
770.486.643  
770.486.6432  
gif@bellsouth.net

**Irwin Seating**  
Tripp Copeland  
GSE  
770.461.2090  
770.460.2517

D. Bid Alternate No. 4: HVAC and Electrical Alternate (DX units)

Provide mechanical system as described on drawings M-0A, M-1A, M-2A, M-3A, M-4A, M-5A, P1A, P2A, P3A, & P4A and coordinating electrical service as described on drawings E1aA, E1bA, E1cA, E2A, E3A, and E4A and as specified in Section 15020 (Alternate) Ductwork and Accessories and Section 15150 (Alternate) Automatic Controls including Alternate Points List Schedule.

Delete drawings M-0, M-1, M-2, M-3, M-4, M-5, P1, P2, P3, P4, P5, E1a, E1b, E1c, E2, E3, and E4. Delete Section 15 020 Ductwork and Accessories, Section 15 035 Pumps, Section 15 117 Packaged Air-Cooled Chiller, Section 15150 Automatic Controls including Points List Schedule, and Section 15867 Modular Central Station Air Handling Units.

Provide 70LF of masonry wall and foundation at 10'-4" above grade similar to detail 5/A21.

**END OF SECTION 01 030, BID ALTERNATES**



## SECTION 01 040 – PROJECT COORDINATION

### 1. GENERAL

- A. The Contractor shall become thoroughly familiar with the requirements of the Contract Documents, as well as jobsite conditions and the work of separate contractors (if any), and shall make any adjustments necessary to maintain the Project schedule.
- B. Close coordination will be required by the Contractor with the County, Construction Manager, other authorities having jurisdiction, separate contractors (if any), and others having an interest in the Project to assure that all work on the site, access to and from the site, and the general conduct of the operations is maintained in a safe and efficient manner, and that disruption and inconvenience to existing streets and property are minimized.
- C. The Contractor and its subcontractors of all tiers shall be subject to such rules and regulations for the conduct of the Work as the County, Construction Manager, or other authority having jurisdiction may establish.

### 2. COORDINATION OF THE WORK

- A. The Contractor shall be completely responsible for the coordination of its Work, including the Work performed by its subcontractors of all tiers.
- B. Observation of the Work by the Construction Manager or others shall not be interpreted as relieving the Contractor of its responsibility for the coordination of all Work, superintendence of the Work, or scheduling and direction of the Work.
- C. The Contractor shall coordinate its Work with the work of any separate contractors through the Construction Manager for proper function and sequence, coordinating material deliveries and staging of same, all to avoid construction delays.
- D. The Contractor shall review material and equipment staging requirements with the Construction Manager prior to placing such materials or equipment on the site.
- E. The Contractor shall conduct the Work so as to provide the least possible interference to the activities of adjacent properties and traffic patterns. Confine operations only to areas where construction or support functions are required. Portions of the site beyond areas in which construction or support functions are required are not to be disturbed.
- F. Conceal pipes, ducts, and wiring in floor, wall, and ceiling construction of finished areas wherever possible. If doubt arises as to the means of concealment or the intent of the Contract Documents, request clarification from the Construction Manager prior to proceeding. Mechanical, plumbing, and electrical work shall be tested and inspected in advance of concealment.

### 3. ACCESS & TRAFFIC CONTROL

- A. The Contractor shall maintain free access to all buildings and areas of the site for emergency vehicles, service vehicles, and fire fighting equipment and at no time shall block off or close roadways or designated fire lanes without providing auxiliary roadways and means of entrance acceptable to the County, the Construction Manager, and any other authority having jurisdiction. Fire hydrants shall remain accessible at all times. The Contractor shall provide at least forty-eight (48) hours notice of any changes to such routes.
- B. The Contractor shall be responsible for security of the site and building(s) until acceptance of the Project by the County. The Contractor shall cooperate with the County, the Construction Manager,

and any separate contractors with respect to entry into the Project when requested during non-standard working hours.

- C. The Contractor shall coordinate its operations to minimize the impact on vehicular and pedestrian traffic around the site. Operations and traffic control measures shall comply with the requirements of the authority having jurisdiction.
- D. The Contractor shall protect all street pavements, curbs, sidewalks, and other existing infrastructure not intended for demolition or alteration during the course of the Work, and shall repair all parts of same which become damaged.
- E. The Contractor shall be responsible for the cleaning of adjacent and surrounding streets and sidewalks from debris, dirt, mud, or other deleterious materials resulting from operations under this Contract. The Contractor shall immediately clean any such areas as directed by the Construction Manager.

#### **4. WORKING HOURS**

- A. The Contractor shall work whenever conditions permit (regardless of anticipated or orderly procedure, the operations of the County or other contractors, or conditions encountered) to proceed without delay and to maintain schedule dates. All operations shall be conducted so as to comply with all applicable laws, ordinances, and regulations regarding allowable hours of work.
- B. The Contractor shall notify the Construction Manager at least forty-eight (48) hours in advance of planned late night or weekend work. Failure to provide such notice may be cause for the Construction Manager to require the removal or uncovering of Work performed without the knowledge of the Construction Manager.

#### **5. EXISTING UTILITIES AND OTHER SERVICES**

- A. Utilities and/or other services which are shown, or not shown but encountered, shall be protected by the Contractor from any damage from any work operations of the Contract, unless or until they are abandoned. If the utilities or services are not abandoned at the time of damage, the Contractor shall immediately repair any damage from its work operations and restore the utilities or services to an equal or better conditions than that which existed prior to the damage.
- B. The Contractor and its subcontractors of all tiers shall be responsible for all damage to the Project including any existing buildings and grounds due to its operations under this Contract. Repair or replacement of damaged items shall be to the satisfaction of the County and the Construction Manager.

#### **6. PROTECTION OF FINISHED WORK**

- A. The Contractor shall be responsible for protecting its finished Work and materials from damage from any source, and shall maintain such protection until acceptance of the Work by the County. Any damage to finished Work caused by the work operations of this Contract shall be repaired, or such damaged Work replaced, by the Contractor at no additional cost to the County. No exceptions to this policy will be allowed.
- B. The Contractor shall coordinate the proper means by which materials and/or equipment are moved through the construction, ensuring that no structural overloading is allowed and that existing construction is protected from physical damage.
- C. Protect existing trees on the site to be saved, and those on adjacent properties where in close proximity to the Work. Carefully wrap trees adjacent to the construction work, material storage area, and trucking lanes in burlap and encase with protective framework. Protect roots during excavation and grading to minimize disturbance and damage.

- D. Keep concrete floors free of oils, grease, and other materials to prevent discoloring if to be left exposed, or to prevent adverse bonding affects if a finished floor is to be applied. Where work is performed over finished floors, the Contractor shall provide an acceptable cover to protect the finished surface against damage, paint, or stains.
- E. Load no part of the structure during construction with a load greater than calculated to bear safely when completed. Make temporary supports as strong as permanent supports. Place no load on a concrete slab until it has cured and achieved sufficient strength.
- F. Take strict precautions against unnecessary traffic on finished roofing surfaces.
- G. Protect all glass surfaces during construction. Prior to Substantial Completion, replace any broken, scratched, or otherwise damaged glass with glass of the same type, size, and quality as the original.

**END OF SECTION 01 040, PROJECT COORDINATION**



## SECTION 01 045 – CUTTING, CORING & PATCHING

### 1. GENERAL

- A. "Cutting, Coring and Patching" is hereby defined to include, but not necessarily be limited to, removal, cutting (including excavation), coring, fitting and patching of nominally completed and previously existing Work, as shown or required in order to accommodate the coordination of Work, installation of new Work, to uncover other Work for access or inspection, remove and replace defective Work or Work not conforming to the Contract Documents, or to obtain samples for testing or for similar purposes.
- B. For existing buildings, the sizes, dimensions, and elevations shown on the drawings represent measurements which should be regarded as typical dimensions; actual dimensions may and will vary due to prevailing building practices at the time of construction, and building settlement over time.
- C. The requirements of this section apply generally to all aspects of the Work, including mechanical, electrical and special systems work, unless otherwise indicated. The Technical Specifications may include additional or more specific requirements or limitations applicable to individual units of work.
- D. The Contractor shall note that it is its responsibility to coordinate the locations and sizes and to cut or core all openings and penetrations for all trades involved in the Work of this Contract. Any openings and penetrations which may be shown on drawings provided by the County are intended only to assist the Contractor in coordinating the major openings and penetrations and are not representative of all openings which will be required to complete the work.

### 2. QUALITY ASSURANCE

- A. The Contractor shall not cut, core and patch structural work in a manner resulting in a reduction of load-carrying capacity or load/deflection ratio. Prior to cutting, coring and patching structural work, obtain Architect's approval to proceed with cutting and patching as proposed in a written submittal by the Contractor.
- B. The Contractor's submittal requesting consent to proceed with cutting, coring and patching structural work must include:
  - 1. Identification of the Project
  - 2. Description of the affected Work
  - 3. Necessity for cutting or coring
  - 4. Affects on other Work, and on the structural integrity of the Work
  - 5. Description of the proposed Work, which designates:
    - a). Scope of cutting, coring and patching

- b). Subcontractor who will execute the work
  - c). Products proposed to be used
  - d). Extent of refinishing required
  - 6. Alternates to cutting, coring and patching
  - 7. Designation of the responsibility for the costs associated with the cutting, coring and patching
- C. Prior to performing any cutting, coring and patching as extra work, the Contractor shall have submitted a written cost proposal and received written direction from the Construction Manager.
- D. The Contractor shall be responsible for providing, locating, and installing all embeds necessary for the completion of the Work, so as to avoid unnecessary cutting and patching.

### **3. OPERATIONAL AND SAFETY LIMITATIONS**

- A. The Contractor shall not cut and patch operational elements and safety-related components in a manner resulting in a reduction of capacities to perform in the manner intended including energy performances, or resulting in decreased operational life, increased maintenance, or decreased safety.
- B. The Contractor shall not cut, core drill or otherwise penetrate any post-tensioned cast-in-place concrete elements.

### **4. VISUAL REQUIREMENTS**

The Contractor shall not cut and patch work which is exposed on the exterior, or exposed on the interior in occupied spaces of the building, in a manner resulting in a reduction of visual qualities, or resulting in substantial evidence of cut and patch work, as judged solely by the Architect. The Contractor shall remove and replace work judged by the Architect to be cut and patched in a visually unsatisfactory manner.

### **5. MATERIALS**

The Contractor shall provide materials for cutting and patching which will result in equal or better work than work being cut and patched, in terms of performance characteristics and including visual effect where applicable. The Contractor shall comply with requirements, and use materials identical with original materials where feasible and where recognized that satisfactory results can be produced thereby.

### **6. PREPARATION**

- A. Inspection of Concealed Conditions (for construction existing prior to this Contract, if applicable) - Prior to beginning installation or preparation of shop drawings for each unit of work involving exposure of existing concealed construction, the Contractor shall remove the minimum of finishes, substrates and other existing construction as necessary to expose existing conditions where work

is required behind existing surfaces. The Contractor shall verify that work can proceed in accordance with the requirements of the Contract Documents. The Contractor shall prepare detailed drawings of any existing conditions which differ substantially from conditions indicated or implied by the Contract Documents and the existing construction visible prior to exposure of concealed conditions. Submit drawings and a cost proposal to the Construction Manager for transmittal to the Architect a minimum of fourteen (14) calendar days prior to the scheduled installation of work in that area or the preparation of any required submittals relating to the area in question.

- B. Inspection of Concealed Conditions (for Work installed under this Contract) – In the event work is required behind existing surfaces previously installed under this Contract, the Contractor shall remove the minimum of finishes, substrates and other existing construction as necessary to expose existing conditions where work is required behind existing surfaces. Inspect and assess all conditions affecting the continued performance of the Work, and immediately report any circumstances which could have an adverse effect on the performance of the Work to the Construction Manager.
- B. Temporary Support - The Contractor shall provide shoring and protection and/or temporary support for work to be cut, to prevent failure. Do not endanger other work.
- C. Protection - The Contractor shall provide protection of other work during cutting and patching, to prevent damage and provide protection of the Work from adverse weather conditions. The Contractor shall not cut or alter work of another contractor without written consent of the Construction Manager.

## 7. CUTTING AND PATCHING

- A. The Contractor shall employ skilled tradesmen to perform all cutting, coring and patching and who have experience working with the materials involved. Except as otherwise indicated or approved by the Construction Manager or the Architect, the Contractor shall proceed with cutting and patching at earliest feasible time in each instance, and complete work without delay.
- B. The Contractor shall cut work by methods least likely to damage work to be retained and work adjoining. Employ the original installing subcontractor to perform cutting and patching for weather-exposed or moisture-resistant elements, and for exterior or interior surfaces exposed to view.
- C. In general, where physical cutting action is required, the Contractor shall cut work with sawing and grinding tools, not with hammering and chopping tools. Make cuttings to neat, straight lines and only to the size required to accommodate the construction to be installed. Core drill openings through finished concrete work.
- D. The Contractor shall patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work. Where feasible, inspect and test patched areas to demonstrate integrity of work.

- E. The Contractor shall restore exposed finishes of patched areas and extend finish restoration onto retained work adjoining, in a manner which will eliminate evidence of patching and refinishing. Where a patch occurs in a smooth painted surface, the Contractor shall extend the final paint coat over entire unbroken surface containing patch, after patched area has received prime and base coats.
  
- F. Wherever existing concrete floors are required to be patched or leveled, and where slabs are chopped out to provide for installation of new concrete floors, and where existing concrete is to be extended, the Contractor shall apply concrete bonding agent before placing new concrete. Apply such bonding agent in accordance with the manufacturer's specifications.

**END OF SECTION 01 045, CUTTING, CORING & PATCHING**

## SECTION 01 050 – LAYOUT OF THE WORK

### 1. PROJECT LAYOUT REQUIREMENTS

- A. The Contractor shall be responsible to accurately establish and maintain all principal lines, grades, and levels for the Work.
- B. Establish a minimum of two permanent bench marks on the site, referenced to data established by survey control points.
- C. Establish lines and levels, and locate and lay out by instrumentation and similar appropriate means, the following:
  - 1. Site improvements, including, but not limited to, pavement; stakes for grading, fill and topsoil placement; and utility slopes and invert elevations
  - 2. Grid and axes for structures
  - 3. Building foundations, column locations, and floor elevations
  - 4. Controlling lines and levels required for mechanical, electrical, and other trades
- D. Protect and preserve the established control points, monuments, stakes, bench marks, or other datum points. The Contractor shall not make any change in location without the written approval of the Construction Manager. Any control points lost or displaced through the neglect of the Contractor shall be replaced at no additional cost to the County.
- E. Verify the overall and critical dimensions and elevations for the Work prior to commencement of construction. Submit a written statement to the Construction Manager of the acceptance of the location of all existing conditions and previously completed construction, if any, as it relates to the Work of this Contract.
- F. Verify all drawing dimensions and existing measurements as the Work progresses at the site. No extra charges shall be allowed for differences between actual field measurements and any dimensions shown on the Contract Documents. Do not provide filler pieces or closures without approval from the Construction Manager.
- G. Verify and maintain layouts during construction operations, using the same methods as were used to establish original layouts.
- H. All Work, and in particular piping, ducts, conduit, and similar items, shall be neatly and carefully laid out to provide the most useful space utilization and the most orderly appearance. Except as otherwise indicated or directed, piping and similar work shall be installed as close to ceilings and walls as conditions reasonably permit. These items shall be located to prevent interference with other work and with the use of the spaces in the manner required by the functions of the space and

the County. Valves shall be located in inconspicuous but accessible locations. Before proceeding with any work exposed to view, the Contractor shall carefully plan the layout and review any questionable installations with the Construction Manager.

- I. Maintain a complete and accurate log of control and survey work as it progresses. Indicate all control point locations, with horizontal and vertical data, on the record drawings submitted at Substantial Completion.

## **2. QUALITY ASSURANCE / QUALITY CONTROL**

- A. The Contractor shall employ qualified personnel to stake out/locate the reference points as needed to properly locate the Work of the Contractor and all subcontractors. Land surveyors and engineers utilized in layout work shall be registered professionals, licensed in the State of Georgia, and acceptable to the Construction Manager.
- B. Provide certification by a registered land surveyor or engineer that elevations and locations of improvements are in conformance with the requirements of the Contract Documents.
- C. The Contractor shall be responsible for transferring all required measurements from the control points to the required locations throughout the Project. If, at any time, the Construction Manager questions the transference of such dimensions, the Contractor shall, at no additional cost to the County, verify the transference of questionable dimensions to the Construction Manager.

## **3. COORDINATION**

- A. Upon Notice to Proceed, and again prior to commencement of construction, examine the site and the conditions under which the Work is to be installed, and notify the Construction Manager in writing of any discrepancies or conditions detrimental to the proper performance of the Work. The Contractor is not to proceed until any such discrepancies or detrimental conditions are corrected.
- C. Obtain accurate field dimensions in ample time to permit fabrication of items requiring same, and allow for delivery and installation in time to maintain the project schedule. The Contractor and all subcontractors shall cooperate and coordinate in completing the work phases to accommodate the schedule for obtaining dimensions and to prevent fabrication delay. In the event it is impractical to have work in place to permit field dimensions to be taken, the Contractor shall guarantee necessary dimensions to fabricators and be responsible to ensure those dimensions will be accurate.
- D. The Contractor shall furnish approved copies of all relevant information (shop drawings, diagrams, templates, technical data, etc.) to the County or to separate contractors, as required for coordination with any work of the Project by others.

**END OF SECTION 01 050, LAYOUT OF THE WORK**

## SECTION 01 090 – REFERENCE STANDARDS

### 1. APPLICABILITY OF STANDARDS

- A. Where reference is made to standards or specifications published by various organizations ("standards"), the Work shall conform to latest edition of such standards as amended and revised in effect at the date of Contract, unless a specific date is indicated.
- B. Where material is designated for certain applications, material shall conform to standards designated in the applicable building code governing the Work. Similarly, unless otherwise specified, installation methods and standards of workmanship shall also conform to standards required by such code. Where no particular material is specified for a certain use, the Contractor shall select from choices offered in the governing code.
- C. Where a standard does not provide all information necessary for the complete installation of an item, comply with manufacturer's instructions for installation and workmanship.
- D. Where specific articles, sections, divisions or headings for standards are not given, such standards shall apply as appropriate. Standards when included in the Contract Documents by abbreviations or otherwise, shall form a part of Contract Documents. In the event of conflicts between cited standards and/or the Contract Documents, the more stringent shall govern.

### 2. ABBREVIATIONS AND ACRONYMS

- A. Abbreviations and acronyms used throughout the Contract Documents refer to associations, institutes, societies and other public bodies who publish standards which are readily available to the public, and to the titles of the standards which they publish. Where such abbreviations or acronyms are used in the Contract Documents, they shall mean the recognized name of the trade association, standards-generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.
- B. Whenever initials representing such a body are shown, followed by a number or a combination of numerals and letters, reference is to a particular standard to which Contractor shall conform. The number or combination of numerals and letters following abbreviation designates the particular standard to be followed.

### 3. CONTRACTOR'S DUTIES AND RESPONSIBILITIES

The Contractor shall be responsible when required by Contract Documents, or upon written request from the Construction Manager, to deliver required proof that materials or workmanship, or both, meet or exceed the requirements of a reference standard.

### 4. CONFLICTING STANDARDS

Where compliance with two or more standards is specified and where the standards may establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different but apparently equal and other uncertainties to the Architect, through the Construction Manager, for a decision before proceeding.

### 5. COPIES OF STANDARDS

Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract

Documents. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.

**END OF SECTION 01 090, REFERENCE STANDARDS**

## SECTION 01 200 – PROJECT MEETINGS

### 1. GENERAL

- A. The Construction Manager will determine the agenda for and chair the meetings described below, and also shall prescribe the format for the documentation of the meetings to be produced by the Contractor.
- B. Representatives of the Contractor and its subcontractors and suppliers in attendance at any project meeting shall be qualified and authorized to act on behalf of the entity each represents.
- C. The Contractor shall schedule and administer project meetings throughout progress of Work where specified or required, and shall have the following specific responsibilities:
  - 1. Distribute Construction Manager's agenda for meetings
  - 2. Distribute written notice of each meeting a minimum of four days in advance of meeting date
  - 3. Make physical arrangements for meetings
  - 4. Record minutes, in the format to be provided by the Construction Manager, to include significant proceedings and decisions
  - 5. Reproduce and submit word processed minutes, within four working days after each meeting, to the Construction Manager for approval before further distribution. After approval, distribute copies as follows:
    - a. to all participants in the meeting
    - b. to all parties affected by decisions made at meeting
    - c. to all other parties as may be designated by the County or Construction Manager
- D. The County's user department(s) will be active participants in the design and construction process for this project, and their representative(s) shall be invited to all project meetings for which their presence and/or participation is appropriate.

### 2. PRE-CONSTRUCTION MEETING

- A. Scheduling: Meetings shall be held at least two weeks prior to any Work commencing on the site.
- B. Location: Designated by Construction Manager.
- C. Attendance:
  - 1. Owner/user group representative(s), as appropriate
  - 2. Construction Manager' representative
  - 3. Architect's representative (at it option)

4. Contractor's Project Manager, Superintendent, and other representative(s) as appropriate
5. Major subcontractors and suppliers
6. Others as appropriate

D. Suggested Minimum Agenda:

1. Discussion of major subcontractors and suppliers
2. Projected construction schedules
3. Critical work sequencing
4. Major equipment deliveries and priorities
5. Project coordination and designation of responsible personnel
6. Procedures and processing of:
  - a. Design issues and decisions
  - b. Field decisions
  - c. Proposal requests
  - d. Submittals
  - e. Change orders
  - f. Applications for payment
7. Adequacy of distribution of Construction Documents
8. Procedures for maintaining record documents
9. Use of premises:
  - a. Office, work and storage areas
  - b. County's, Architect's, and Construction Manager's requirements
10. Construction facilities, controls and construction aids
11. Temporary utilities
12. Safety and first-aid procedures
13. Security procedures and site access controls
14. Housekeeping procedures
15. Traffic and parking procedures
16. Other administrative procedures

**3. CONSTRUCTION PROGRESS MEETINGS**

- A. Scheduling: Meetings shall be conducted at least bi-weekly throughout the construction phase.
- B. Location of the Meetings: Project field office of Contractor or other location designated by Construction Manager.
- C. Attendance:
  1. Owner/user group representative(s), as appropriate
  2. Construction Manager' representative
  3. Architect's representative (at its option)
  4. Contractor's Project Manager, Superintendent, and other representative(s) as appropriate

5. Subcontractors and suppliers as appropriate to the agenda
6. Others as appropriate

D. Suggested Minimum Agenda:

1. Actual vs. scheduled progress since previous meeting
2. Planned construction activities for the next four weeks
3. Problems with and revisions to construction schedule
4. Review of off-site fabrication and delivery schedules
5. Corrective measures and procedures to regain projected schedule
6. Submittal schedules and expediting
7. Construction Document clarifications
8. Field observations, problems, conflicts
9. Quality control
10. Actual and potential changes and their impacts
11. Safety issues

#### **4. PRE-INSTALLATION MEETINGS**

- A. Scheduling: Schedule pre-installation meetings for installation of various aspects of the Work prior to the start of installation, or as otherwise specified in the Project Manual. Do not schedule pre-installation meetings until required submittals have been approved.
- B. Location: At jobsite.
- C. Meeting Requirements:
  1. Prior to installation of work, conduct pre-installation meeting at project site with Contractor's superintendent and foreman, primary materials installer, installer of each component of associated work, representative(s) of materials manufacturer(s), inspection and testing agency representative (if any), installers of other work requiring coordination, Construction Manager, Architect, and Owner's representative for the purpose of reviewing job mock-up (if any), job conditions, project requirements and procedures to be followed in performing work.
  2. At pre-installation meeting, examine areas and conditions under which work is to be performed. Report in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected. Commencement of work shall constitute acceptance of substrate conditions.
  3. At pre-installation meeting, the manufacturer's authorized representative shall inspect storage of job site materials, establish scheduling of initial and final installation of products, and establish the method of preparing written progress reports to Contractor (with copy to Construction Manager) of job conditions and installation.

4. At pre-installation meeting, review manufacturer's product data publications and other published instructions for material installation compliance including shop drawings. Shop drawings and submittals shall be reviewed and approved prior to pre-installation meetings. Contractor shall provide a set of approved shop drawings and submittals for meeting use.
5. Where manufacturer's representative offers recommendations on material use, such recommendations shall be submitted in writing and substantiated by dated, printed, published product data or material use statement which is complete, definite, and clear, and signed by authorized company official.
6. Meeting Report: Submit copy of pre-installation job meeting report. Include copy of manufacturer's inspection report, manufacturer's recommendations, and any statement of non-compliance as applicable.
7. Pre-Installation meetings shall include, but not be exclusive of the following portions of the Work:
  - a. Roof System
  - b. Brick/Masonry
  - c. Glazing & Skylights
  - d. Hollow Metal & Hardware
  - e. Applied Wall Systems & Products
  - f. Equipment & Systems
  - g. Furnishings (prior to ordering)
  - h. Voice/Data/Paging System (prior to ordering)
  - i. Fire/Security Systems
  - j. Combined Mechanical/Electrical/Plumbing & Control Systems

#### **5. INSPECTION TOURS**

- A. Formal inspection tours shall be made of the job progress for the Owner and any other officials as the occasion warrants and as scheduled by the Construction Manager.
- B. If requested by the Construction Manager, the Contractor shall be prepared to show and explain work completed and in progress throughout the Project to the inspection parties.

### **END OF SECTION 01 200, PROJECT MEETINGS**

## SECTION 01 310 – SCHEDULING OF THE WORK

### 1. INTRODUCTION

- A. This Section describes the construction scheduling and progress reporting requirements of the Contract. The primary objectives of the requirements of this Section are:
  - 1. to insure adequate planning and execution of the Work by the Contractor;
  - 2. to assist the County and Construction Manager in evaluating the progress of the Work;
  - 3. to provide for optimum coordination by Contractor of its trades, subcontractors and suppliers, and of its Work with the work or services provided by the County or any separate contractors; and
  - 4. to permit the timely prediction or detection of events or occurrences which may affect the timely prosecution of the Work.

### 2. GENERAL SCHEDULING REQUIREMENTS

- A. The Work of this Contract shall be planned, scheduled, executed, and reported using the critical path method (CPM). The Contractor shall use one of the following software programs to develop its Detailed Construction Schedule:
  - 1. Primavera Project Planner, latest version
  - 2. SureTrak Project Manager, latest version
  - 3. Microsoft Project, latest version (MPX file)
- B. The Detailed Construction Schedule, as defined herein, shall represent the Contractor's commitment and intended plan for completion of the Work in compliance with the Contract completion date and interim milestone dates specified. The Detailed Construction Schedule shall take into account all foreseeable activities to be accomplished by any separate contractors or the County, and interface dates with utility companies, the County's operations, and others. The Detailed Construction Schedule shall anticipate all necessary manpower and resources to complete the Work within the dates set forth.
- C. Once approved by the Construction Manager, the Detailed Construction Schedule will become the Schedule of Record, and will be the basis for coordinating the Work, scheduling the Work, monitoring the Work, reviewing progress payment requests, evaluating time extension requests, and all other objectives listed above. No other schedule will be recognized for this Contract.
- D. The Contractor is responsible for determining the sequence of activities, the time estimates of the detailed construction activities and the means, methods, techniques and procedures to be employed. The Detailed Construction Schedule shall represent the Contractor's best judgment of how it will prosecute the Work in compliance with the Contract requirements. The Contractor shall ensure that Detailed Construction Schedule is current and accurate and is properly and timely monitored, updated and revised as Project conditions and the Contract Documents may require.
- E. When there are separate contractors working concurrently on the Project whose work must interface or be coordinated with the Work of the Contractor, the Contractor shall coordinate its activities with the activities of the separate contractors, and the Detailed Construction Schedule shall take into account and reflect such work by others.

- F. The Contractor shall be solely responsible for expediting the delivery of all materials and equipment to be furnished by it so that the progress of construction shall be maintained according to the currently approved construction schedule for the Work. The Contractor shall notify the Construction Manager in writing, and in a timely and reasonable manner, whenever the Contractor determines or anticipates that the delivery date of any material or equipment to be furnished by the Contractor will be later than the delivery date indicated by the currently approved construction schedule, or required consistent with the completion requirements of this Contract, subject to schedule updates as herein provided.

### 3. DETAILED CONSTRUCTION SCHEDULE

- A. Within two (2) weeks after the Notice to Proceed, the Contractor shall submit a Detailed Construction Schedule according to the requirements established herein.
- B. The Detailed Construction Schedule shall consist of a time-scaled, detailed network graphic representation of all activities which are part of the Contractor's construction plan and an accompanying listing of activity's dependencies and interrelationships. The Detailed Construction Schedule submission shall include, but not be limited to, the following information:
1. Project name
  2. Distinct, logical and identifiable subdivisions of Work
  3. Activities for all aspects of the Work, with durations not exceeding fourteen (14) calendar days for all activities for which the Contractor will perform actual construction work. Material procurement, submittals, concrete curing and other similar activities may exceed fourteen (14) calendar days if approved by the Construction Manager. Related activities, each of a duration of five (5) calendar days or less, may be shown as one activity together, if not on the critical path of timely job completion.
  4. Outage schedules for existing utility services that will be interrupted during the performance of the Work
  5. Acquisition and installation of equipment and materials supplied and/or installed by the County or separate contractors
  6. All start dates, milestones, float and completion dates
  7. An accounting of the number of workdays anticipated to be lost due to weather. This accounting shall be in accordance with allowable days per month provided in Article 8 of the *Owner-Contractor Agreement* (Section 00 500).
  8. A tabular report listing all predecessor and successor activities for each activity
  9. A legible time scaled network diagram showing the critical path.
  10. A listing of the project calendar, indicating the anticipated days of work performance
  11. A floppy computer disk, in a form and format acceptable to the Construction Manager, of the Detailed Construction Schedule including all required submission information resident in the computer system and containing all of the files associated with the schedule.
- C. Activities and milestones to appear on the Detailed Construction Schedule shall include, but not be limited to, sitework, structure erection, roof close-in, exterior wall systems, paving, major material fabrication and delivery, shop drawings submittals, bi-weekly progress meetings, furniture delivery

and installation, equipment delivery and installation, coordination requirements, mock-up installations and inspections, dates of Substantial and Final Completion, Certificate of Occupancy inspection, systems testing and instruction, and special County reviews and decision points that impact the Work.

- D. Schedule Reports: Schedule submissions will contain the following minimum information for each activity:
1. Activity number, description and estimated duration
  2. Anticipated start and finish dates
  3. Responsibility for activity
  4. The cost loading values for each activity.
- E. For all major equipment and materials to be fabricated or supplied for the Project, the Detailed Construction Schedule shall show a sequence of activities including:
1. Preparation of shop drawings and sample submissions
  2. A reasonable time for review of shop drawings and samples or such time as specified in the Contract Documents
  3. Shop fabrication, delivery and storage
  4. Erection or installation
  5. Testing of equipment and materials.
- F. The Contractor shall submit, as a part of the data submitted to the Construction Manager, a narrative report indicating the anticipated allocation by the Contractor of the following resources and work shifts for each activity which he proposes to be utilized on the Project:
1. labor resources;
  2. equipment resources; and
  3. whether it proposes the Work to be performed on single, double or triple shifts, and whether it is to be done on a 5, 6 or 7 day work week basis.
- G. The Construction Manager shall have the right to require the Contractor to modify any portion of the Contractor's Detailed Construction Schedule, or Recovery Schedule, as herein required, (including cost loading) with the Contractor bearing the expense thereof, which the Construction Manager reasonably determines to be:
1. impractical or unreasonable;
  2. based upon erroneous calculations or estimates;
  3. not in compliance with other provisions of the Contract Documents;
  4. required in order to ensure proper coordination by the Contractor of the Work of its subcontractors and with the work or services being provided by any separate contractors;
  5. necessary to avoid undue interference with the County's operations or those of any utility companies or adjoining property owners;

6. necessary to ensure completion of the Work by the milestone and completion dates set forth in the Contract Documents;
7. required in order for the Contractor to comply with the requirements of this Section or any other requirements of the Contract Documents; or
8. not in accordance with the Contractor's actual operations.

## **5. COST LOADING**

- A. As part of the submission of the Detailed Construction Schedule, the Contractor shall submit a breakdown of the expected value of each of the schedule activities for which payment is required.
- B. The cost breakdown of the Detailed Construction Schedule shall have a direct correlation to the Schedule of Values to be used as the basis for Applications for Payment.

## **6. UPDATING OF CONSTRUCTION SCHEDULE/PROGRESS REPORTS**

- A. Not less than seven (7) calendar days before the submission of the monthly progress payment request, or on a date specified by the Construction Manager, the Contractor shall arrange for its Project Manager, Superintendent and necessary subcontractors and suppliers to attend a monthly schedule meeting with the Construction Manager to review the Contractor's report of actual progress. Said report shall set forth up-to-date and accurate progress data, and shall be prepared by the Contractor in consultation with all principal subcontractors and suppliers.
- B. The progress report of the Contractor shall show the activities, or portions of activities, completed during the reporting period, the actual start and finish dates for these activities, remaining duration and/or estimated completion dates for activities currently in progress, and quantities of material installed during the reporting period.
- C. The Construction Manager will produce a computerized update worksheet for the Contractor to complete as a part of this process.
- D. At the monthly schedule meeting a total review of the Project will take place including but not limited to, the following:
  1. Current update of the Detailed Construction Schedule
  2. Anticipated detailed construction activities for the subsequent report period
  3. Critical items pending
  4. Contractor requested changes to the Detailed Construction Schedule.
- E. The Contractor shall submit a narrative with the progress report which shall include, but not be limited to, a description of problem areas, current and anticipated delaying factors and their impact, explanations of corrective actions taken or planned, any proposed newly planned activities or changes in sequence, and proposed logic for a Recovery Schedule, if required, as further described herein. The report shall also include:

1. A narrative describing actual Work accomplished during the reporting period
  2. A list of major construction equipment used on the Project during the reporting period
  3. The total number of men by craft actually engaged in the Work during the reporting period, with such total stated separately as to office, supervisory, and field personnel
  4. A manpower and equipment forecast for the succeeding thirty (30) days, stating the total number of men by craft, and separately stating such total as to office, supervisory and field personnel
  5. A list of Contractor supplied materials and equipment, indicating current availability and anticipated job site delivery dates
  6. Anticipated changes or additions to Contractor's supervisory personnel.
- F. As part of the updating process, the Construction Manager will calculate, based upon progress data provided by the Contractor and agreed to by the Construction Manager, the value of Work completed based on the sum of the cost loading amounts for all activities, including activities specifically defined for stored materials, less the amount previously paid. Summation of all values of each activity less the appropriate percent of retainage shall be the maximum amount payable to the Contractor, provided that the Contractor has complied with all requirements of the Contract Documents.
- G. No invoice for payment shall be submitted and no payment whatsoever will be made to the Contractor until the required narrative reports, as defined herein, have been submitted and the Detailed Construction Schedule has been updated.

## 7. RECOVERY SCHEDULE

- A. Should the updated Detailed Construction Schedule, at any time during the Contractor's performance, show, in the sole opinion of the Construction Manager, that the Contractor is behind schedule for any milestone or completion date for any location or category of work, the Contractor, at the request of the Construction Manager, shall prepare a Recovery Schedule within five (5) days, at no additional cost to the County (unless the County is solely responsible for the event or occurrence which has caused the schedule slippage), explaining and displaying how the Contractor intends to reschedule its Work in order to regain compliance with the Detailed Construction Schedule within thirty (30) calendar days.
- B. If the Contractor believes that all of the time can be recovered within thirty (30) calendar days, the Contractor will be permitted to prepare a Recovery Schedule as set forth below. However, if the Contractor believes it will take more than thirty (30) days to recover all of the lost time, it shall prepare and submit a request for revision to the Detailed Construction Schedule and comply with all of the requirements of a Schedule Revision as set forth in Paragraph 8 below.
- C. The Contractor shall prepare and submit to the Construction Manager a one month maximum duration Recovery Schedule, incorporating the best available information from subconsultants, subcontractors and others which will permit a return to the Detailed Construction Schedule at the earliest possible time. The Contractor shall prepare a Recovery Schedule to the same level of

detail as the Detailed Construction Schedule. The Recovery Schedule shall be prepared in coordination with other separate contractors on the Project.

- D. Within two (2) days after submission of the Recovery Schedule to the Construction Manager, the Contractor and any of the necessary subcontractors, suppliers, vendors, manufacturers, etc. shall participate in a conference with the Construction Manager to review and evaluate the Recovery Schedule. Within two (2) days of the conference, the Contractor shall submit the revisions necessitated by the review for the Construction Manager's review and approval. The Contractor shall use the approved Recovery Schedule as its plan for returning to the Detailed Construction Schedule.
- E. The Contractor shall confer continuously with the Construction Manager to assess the effectiveness of the Recovery Schedule. As a result of these conferences, the Construction Manager will direct the Contractor as follows:
  - 1. If the Construction Manager determines the Contractor continues behind schedule, the Construction Manager will direct the Contractor to prepare a Schedule Revision and comply with all of the requirements of a Schedule Revision as stated herein and the other requirements of the Contract Documents; provided, however, that nothing herein shall limit in any way the rights and remedies of the County and Construction Manager as provided elsewhere in the Contract Documents; or
  - 2. If the Construction Manager determines the Contractor has successfully complied with provisions of the Recovery Schedule, the Construction Manager will direct the Contractor to return to the use of the approved Detailed Construction Schedule.
- F. In carrying out any approved Recovery Schedule, or whenever it becomes apparent that any critical activity completion date may not be met, the Contractor shall take any or all of the following minimum actions, as may be required, at no additional cost to the County:
  - 1. Increase manpower to put the Work back on schedule.
  - 2. Increase the number of working hours per shift, shifts per working day, working days per week, amount of construction equipment, or any combination which will place the Work back on schedule.
  - 3. Reschedule activities to achieve maximum practical concurrence and place the Work back on schedule.
- G. If the Contractor fails to take appropriate action as required by this Paragraph 7 to recover delays in the schedule, the Construction Manager may take action to attempt to put the Work back on schedule and deduct the cost of such action from monies due or to become due the Contractor in accordance with the Contract Documents.

## 8. SCHEDULE REVISIONS

- A. Should the Contractor desire to or be otherwise required under the Contract Documents to make modifications or changes in its method of operation, its sequence of Work or the duration of the activities in its Construction Schedule, it shall do so in accordance with the requirements of this Paragraph and the Contract Documents. The approved Detailed Construction Schedule may only be revised by written approval of the Construction Manager as provided herein.
- B. The Contractor shall submit requests for revisions to the Detailed Construction Schedule to the Construction Manager, using a Schedule Revision Form provided by the Construction Manager, together with written rationale for revisions and description of logic for rescheduling work, substantiating that the milestone and completion dates will be met as listed in the Contract Documents. Proposed revisions acceptable to the Construction Manager and County will be approved in writing and incorporated into the Detailed Construction Schedule.
- C. Requests for revision will be accompanied by evidence acceptable to the Construction Manager that the Contractor's suppliers, subcontractors and sub-subcontractors are in agreement with the proposed revisions.
- D. If there are separate contractors on the Project, the approval of the separate contractors shall be obtained to make the proposed schedule revisions. If accepted by the Construction Manager and County, the revisions shall be binding upon the Contractor and all separate contractors on the Project.
- E. The impact of all change orders to this Contract shall be included in the Detailed Construction Schedule.

## 9. FLOAT TIME

- A. Float or slack time associated with one chain of activities is defined as the amount of time between earliest start date and latest start date or between earliest finish date and latest finish date for such activities, as calculated as part of the currently approved construction schedule. Float or slack time shown on the currently approved construction schedule is not for exclusive use or benefit of either the County or the Contractor and is available for use by either of them according to whichever first needs the benefit of the float to facilitate the effective use of available resources and to minimize the impact of Project problems, delays, impact, acceleration or changes in the Work which may arise during performance. The Contractor specifically agrees that float time may be used by the County or Construction Manager in conjunction with their review activities or to resolve Project problems. The Contractor agrees that there will be no basis for any modification of the milestone or completion dates or an extension of the Contract Time, or a claim for additional compensation as a result of any Project problem, delay, impact, acceleration, or change order which only results in the loss of available float on the currently approved construction schedule.

- B. Float time shown on any construction schedule shall not be used arbitrarily by the Contractor in a manner which, in the opinion of the Construction Manager, unnecessarily delays separate contractors from proceeding with their work in a way which is detrimental to the interests of the County.

**END OF SECTION 01 310, SCHEDULING OF THE WORK**

## SECTION 01 320 – REPORTS

### 1. DAILY REPORTS

- A. The Contractor's Superintendent shall prepare and submit Daily Reports throughout the construction phase of the Work. Daily Reports shall be kept in an orderly manner at the site, available for inspection or review when requested by the Construction Manager or the Architect. Copies of Daily Reports shall be accumulated and submitted to the Construction Manager on a weekly basis, on a regular day and time to be determined by the Construction Manager. Failure to submit Daily Reports or to comply with the format requirements below is cause for the Construction Manager to retain additional monies due the Contractor from the monthly Application(s) for Payment until such time as the reports have been brought up to date by the Contractor.
- B. Each Daily Report shall include the following information at a minimum:
1. Manpower by subcontractor, trade, and skill level
  2. Weather and temperatures (AM and PM)
  3. List of visitors to the jobsite
  4. Specific work performed with locations
  5. Situations or circumstances which could delay the Work or give cause for a time extension or additional cost
  6. Instructions requested (and of whom)
  7. Materials received
  8. Major equipment arrival/departure
  9. Total days accrued under the terms of the Contract Documents
  10. Accidents and incidents
  11. Safety issues
  12. Meetings
  13. Other significant events at the jobsite
- C. The Contractor shall take the necessary action required to specifically alert the Construction Manager to items which could result in impacts to the progress of the Work. Such items shall be clearly highlighted in the report.
- D. All Daily Reports shall be clearly handwritten or typed. Poor copies, reports in sloppy or illegible handwriting, or on wrinkled paper will not be accepted.

**END OF SECTION 01 320, REPORTS**



## SECTION 01 340 – SHOP DRAWINGS, PRODUCT DATA & SAMPLES

### 1. GENERAL

- A. This Section covers provisions for the submittal of shop drawings, product data, and samples prior to construction, and supplements the Owner-Contractor Agreement.
- B. The Contractor is required to make all submittals in accordance with the Contract Documents. Refer to the individual Technical Specifications for identification of equipment and materials for which submittals are required.
- C. Provisions in this Section are mandatory procedures for preparing and submitting shop drawings, product data, and samples.
- D. Required shop drawings, product data, and samples shall be coordinated, prepared, and submitted so as not to impact the project schedule. Submittals for interfacing units of work, and different categories of submittals for the same work, shall be coordinated and sequenced so that one will not be delayed by another. Adequate time shall be allowed for review by the Architect, and for possible resubmittal. Delays or impacts due to the Contractor's failure to make or process submittals in a timely fashion are solely the responsibility of the Contractor. The Contractor has an obligation to notify the Construction Manager in a timely manner if the submittal review process, with respect to reviews by the Architect might cause a schedule impact on the required delivery of any materials or fabricated assemblies required to execute the Work.
- E. Project delays or delays in the purchasing of materials or equipment occasioned by the requirement for resubmission of shop drawings, product data, and samples not in accordance with the Contract Documents are the Contractor's sole responsibility and will not be considered valid justification for time extensions.
- F. No portion of the Work requiring the submittal of shop drawings, product data, or samples shall be commenced until each such submittal has been reviewed by the Architect, and the action required on the returned submittal does not require a correction and resubmittal (i.e., "No Exceptions Taken" or "Make Corrections Noted," or similar notation); and further, each installer shall have possession of such final reviewed submittal prior to commencing its portion of the Work.
- G. The Contractor shall be responsible for distribution of all copies of initial and approved submittals required for coordination with others concerned with the Work.
- H. Submittals requiring review by the Architect shall be delivered to the Construction Manager's office, unless directed otherwise by the Construction Manager. Submittals are to be scheduled and submitted to allow adequate time for review.

## 2. DEFINITIONS

- A. "Shop Drawings" are drawings, diagrams, illustrations, schedules, performance charts, manufacturer's data sheets, brochures and other data which are prepared and submitted by the Contractor and its subcontractors to illustrate in detail some portion of the Work. The Architect's drawings are not acceptable as shop drawings.
- B. "Product Data" are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor and its subcontractors to illustrate a material, product, or system for some portion of the Work.
- C. "Samples" are physical examples prepared for submission by the Contractor and its subcontractors to illustrate materials, equipment, or workmanship, and to establish standards by which the work will be judged as complying with the Contract Documents. Mock-ups are a special form of samples, too large or otherwise inconvenient for transmittal in the manner specified. Mock-up requirements are specified elsewhere in the Contract Documents.

## 3. SUBMITTAL REGISTER

- A. Within ten (10) days of the Contractor's receipt of the Notice of Award, the Contractor shall submit a comprehensive Submittal Register to the Construction Manager, showing all items requiring submission as defined in the General Requirements and the Technical Specifications.
- B. No submittals will be accepted or reviewed until the Submittal Register has been submitted, reviewed, and approved by the Architect and the Construction Manager as to content and format.
- C. The Submittal Register shall be updated by the Contractor and resubmitted on a monthly basis, or as otherwise required by the Construction Manager.
- D. The initial format of the Submittal Register shall be determined by the Contractor. If any aspect is lacking, the Submittal Register shall be reworked and resubmitted in a format as prescribed by and to the level of detail required by the Construction Manager.
- E. The Submittal Register shall be organized by Specification Section, and shall be further broken down as submittals from subcontractors will be structured.
- F. The Submittal Register shall include all required submittals for test procedures, training programs, operation and maintenance manuals, and any other submittals required by the General Requirements.
- G. The Submittal Register shall include the following information at a minimum:
  - 1. Submittal breakdown by Specification Section and Paragraph number.
  - 2. Scheduled date for initial submittal of each item.

3. Number of calendar days required after review to fabricate and deliver the specified item to the jobsite (if applicable).

#### **4. PREPARATION OF SUBMITTALS**

- A. General Identification: All shop drawings, product data, and samples submitted for review shall have the following identification data, as applicable, contained thereon or permanently affixed thereto.

1. Date of submission and the dates of any previous submissions
2. Project title and location
3. Job number
4. Contract identification
5. Names of the Contractor, subcontractor, installer, supplier, and manufacturer
6. Identification of product (brand name, model number), use, and location
7. For each shop drawing: drawing number, drawing title, revision number, and date of drawing and all subsequent revisions
8. Corresponding Specification Section and Paragraph reference from Contract Documents
9. Field dimensions, clearly identified as such
10. Relation to adjacent or critical features of Work or materials
11. Applicable standards, such as ASTM or Federal Specification numbers
12. Identification of deviations from the Contract Documents
13. Identification of revisions from previous submittals (if a resubmittal)
14. Contractor's stamp, initialed or signed, and dated

- B. Shop Drawing Preparation

1. Provide newly-prepared information with graphics at accurate scale (except as otherwise indicated).
2. Number all sheets consecutively.
3. Indicate all working and erection dimensions. Identify all dimensions based on field measurement.
4. Show arrangements and sectional views.
5. Indicate kinds of materials and finishes, anchoring and fastening details, including information for making connections to other Work. Furnish installation instructions to be followed in the field to achieve manufacturer's designed and planned intentions.
6. Indicate corresponding detail numbers from Contract Drawings in addition to numbering systems used on shop drawings.

7. Form:
  - a. Up to 11" x 17" in size may be either prints on opaque paper, or reproducible transparency. The use of 8-1/2" x 14" size shall not be acceptable.
  - b. Prepare submissions larger than above on reproducible, correctable transparent sheets between 18" x 24" (minimum) and 30" x 45" (maximum) in size.
8. Number of copies to be submitted:
  - a. The Contractor shall submit one (1) reproducible copy and five (5) print copies for review.
  - b. Copies shall be grouped together such that one set of all copies can be removed immediately without the necessity to remove and re-sequence the remaining copies.
9. Associated drawings relating to a complete assembly shall be submitted simultaneously to the greatest extent possible, so that each may be checked in relation to each other and the total assembly.
10. Composite Coordination Shop Drawings:
  - a. The locations and routing of all mechanical and electrical systems shall be delineated on coordinated composite layout drawings, to be submitted by the Contractor and reviewed by the Architect and the Construction Manager according to the procedures above. Such coordination shall consider all other building systems, including structural members and their elevations.
  - b. The composite drawings shall accommodate layering of ductwork, plumbing supply, waste, roof drainage and vent piping, fire protection piping, HVAC piping, electrical conduit, control systems conduit, light fixture locations, sprinkler head locations, HVAC ceiling-mounted and wall-mounted air devices, and life-safety system device locations.
  - c. Provide plan views of all ceiling plenum spaces, duct and pipe shafts, and mechanical and electrical rooms. Show all ceiling grid patterns and walls. Clearly indicate top and bottom elevations of work, including elevations of wall-mounted devices.
  - d. Clearly indicate all penetrations of smoke and fire-rated walls and ceilings. Indicate recommended smoke stop or fire stop method, cross-referenced to Division 7 Specification requirements.
  - e. Composite drawings shall be 1/4" = 1'-0" minimum scale.

C. Product Data Preparation

1. Product data submittals shall be made by Specification Section. All items within a Specification Section requiring submissions shall be submitted together. If two or more

Sections require inter-coordination (e.g. Air Handling Unit and Vibration Isolation, or Emergency Generator and Transfer Switch), they shall be submitted at the same time. Each individual submittal item shall be marked to show the Specification Paragraph number which pertains to that item.

2. Include manufacturer's standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked, and coordination requirements.
3. Clearly mark each copy to identify pertinent products, brand names, or models, and to indicate which choices and options are applicable to the Work.
4. Modify each copy to delete information which is not applicable to the Work. Supplement standard information to provide information specifically applicable to the Work and to job conditions.
5. Include performance characteristics and capacities.
6. Include dimensions and clearances required.
7. Include wiring or piping diagrams and controls.
8. Form:
  - a. Submit all items within a Specification Section in a tabbed binder, with an index.
  - b. Submittals for multiple but related Specification Sections may be grouped in the same binder, if adequately indexed and tabbed for easy reference.
  - c. If product submittals bound together exceed the capacity of one binder, two or more binders shall be used, and notations shall be made on the covers of each indicating the number of binders in the set and the number of each binder (i.e., 2 of 3).
9. Number of copies to be submitted: five (5).

**D. Sample Preparation**

1. Provide samples which are identical with the final condition of proposed materials or products for the Work.
2. Provide "range" samples (not less than three (3) units) where unavoidable variations must be expected, and describe or identify variations between units of each set.
3. Provide a full set of optional samples where selection is required.
4. Provide information with each sample to show generic description, source or product name and manufacturer, limitations, and compliance with standards.

5. Number of samples to be submitted: three (3).
6. Maintain one set of all approved samples at the jobsite, in suitable condition, for quality control comparisons by the Construction Manager. Jobsite quality control samples shall become the property of the County.
7. Returned submittals which are intended or permitted to be incorporated into the Work shall be so indicated in the individual Specification Sections, and shall be in a suitable and undamaged condition at the time of incorporation.

E. Other Submittals

1. Inspection and Test Reports: Classify each as either a "shop drawing" or "product data," depending on whether report is uniquely prepared for the Project or a standard publication of workmanship control testing at point of production, and process accordingly.
2. Letters of Material Certification: Submit for specified materials, items, or equipment, and when requested. Letters of certification shall certify that material or equipment submitted complies with the Contract Documents and shall be submitted with substantiating supporting data (i.e., test reports from approved independent testing laboratory or other approved source). Classify as "product data."
3. Fire Rating and Acoustical Rating Certifications: Submit notarized certifications with shop drawings and material samples which are required to show or have a fire or acoustical rating.

5. TRANSMITTAL

- A. Transmit all shop drawings, product data, and samples to the Construction Manager for transmittal to the Architect.
- B. Accompany each submittal to the Construction Manager with a transmittal letter, in duplicate, containing the Project name, Contractor's name, contract number and description, and brief description of submittal, including the number of drawing sets, data sets, and/or samples included. Include an outline of deviations, if any, from the requirements of the Contract Documents, and itemize proposed changes in the Contract Sum or Contract Time, if any. Where no change in the Contract Sum or Contract Time is indicated by the Contractor, it shall be concluded that no such change is involved for making the change.

6. CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor shall prepare and submit all submittals with promptness and in accordance with the project schedule.

- B. The Contractor shall determine and verify prior to submittal of any shop drawing, product data, or sample, the following:
  - 1. Field measurements
  - 2. Field construction criteria and job conditions
  - 3. Catalog numbers and similar data
  - 4. Conformance with Specifications
- C. Any deviation in a submittal from the requirements of the Contract Documents shall be called to the attention of the reviewing party in writing at the time of the submittal.
- D. The Contractor shall affix its stamp, with initials or signature, and date, prior to submittal to the Construction Manager, indicating its review and concurrence that the submittal conforms to the Contract Documents.
- E. All copies of submittals shall include the stamp indicated above, and previous revisions, if any, shall be clouded and noted. Failure to adhere to these requirements will result in the return of the unreviewed submittal to the Contractor for re-submittal, with the Contractor responsible for any impact to the project schedule resulting there from.
- F. If re-submittals are necessary, they shall be made as specified above for initial submittals. Re-submittals shall highlight all revisions made and the cover shall include the phrase, "Re-submittal No. \_\_\_\_\_."
- G. All re-submittals shall carry the same submittal number but shall have a suffix designation which is designed to signify that the package is a re-submittal. This suffix designation shall be changed for each subsequent re-submittal.

## 7. CONSTRUCTION MANAGER'S RESPONSIBILITIES

- A. The Construction Manager will provide a general review of all submittals for completeness and compliance with submittal procedures as outlined herein.
- B. The Construction Manager will return to the Contractor, without review, all submittals not bearing the Contractor's review stamp or not indicating that the submittal has been reviewed by the Contractor. All costs resulting from unnecessary delays of this type will be the responsibility of the Contractor.
- C. The Construction Manager will forward acceptable submittals to the Architect for review.
- D. After the Architect review, the Construction Manager will forward reviewed submittals to the Contractor and retain one copy for the County. The Contractor will provide additional distribution copies to the Construction Manager of any submittals in a "No Exceptions Taken" status as directed by the Construction Manager at any time during execution of the contract.

## 8. ARCHITECT'S RESPONSIBILITIES

- A. Shop drawings, product data, and samples will be examined by the Architect with reasonable promptness and returned to the Construction Manager. Allow a reasonable time for processing by the Architect and the Construction Manager in addition to transit time.
- B. Shop drawings, product data, and samples will be returned to the Contractor noted for action as follows:
  - 1. "Rejected" – indicates that the submission is unacceptable and requires resubmission. In the case of a mock-up, reconstruction will be required. The Contractor shall make corrections as noted and resubmit. Fabrication shall not begin on items covered by submittals bearing this notation.
  - 2. "Make Corrections Noted" – indicates that the Contractor shall make the corrections indicated on the returned submittal. This notation will permit fabrication to begin on all items subject to the corrections indicated. If "Resubmit" has been added after "Make Corrections Noted," the Contractor shall delay fabrication on items affected by the corrections, make appropriate changes and resubmit.
  - 3. "No Exceptions Taken" – indicates that fabrication may begin on all items.
  - 4. "Not Required for Review" – indicates that no submittal is required.
- C. The Architect will apply its document review stamp, with signature or initials, on all reviewed copies of submittals. Through the Construction Manager, one copy of all reviewed submittals will be returned to the Contractor; for shop drawings where reproducible copies are submitted, one print and one reproducible copy will be returned.
- D. The Technical Specifications for structural, mechanical and electrical work may modify the above requirements and shall govern in the event of conflict.
- E. If the Contractor has a complaint with either the time required or the information provided by the Architect's review, it shall be expressed in writing at the time the submittal is returned. Failure by the Contractor to file such complaints at that time will prevent attempting to allege delays or impacts resulting there from at a later date. Such complaints must be fully detailed, and if additional information is requested by the Construction Manager, it shall be provided as soon as becomes available, but in no case later than ten (10) days from the return of the submittal in question.
- F. The Architect's review of a submittal shall not be construed as an indication that it is correct or suitable, nor that Work represented by a submittal complies with the Contract Documents, except as to matters of finish, color, and other aesthetic matters left to the Architect's decision by the Contract Documents. Further, reviews by the Architect of submittals of details for any material, apparatus, device, etc., will not relieve the Contractor from responsibility for furnishing same of

proper dimension, size, quantity, and quality to efficiently perform the Work and carry out the requirements and intent of the Contract Documents.

**9. RECORD SUBMITTALS**

- A. At Substantial Completion of the Work, the Contractor shall deliver to the Construction Manager one copy of all final, approved submittals for the County's record.
- B. Record submittals not in the form of drawing rolls shall be neatly labeled and organized by Specification Section and boxed in a "Banker's Box" or equivalent. Rolls of shop drawings shall be labeled appropriately for easy reference.

**END OF SECTION 01 340, SHOP DRAWINGS, PRODUCT DATA & SAMPLES**



## SECTION 01 370 - SCHEDULE OF VALUES

### 1. GENERAL SUMMARY

A. The Contractor shall submit to the Construction Manager a Schedule of Values for the entire Contract, either within ten (10) days of Contract award or fifteen (15) days prior to the first Application for Payment deadline, whichever comes first.

#### B. Breakdown and Content

The Schedule of Values will be submitted in a format as prescribed by and to the level of detail specified by the Construction Manager.

1. The sum of the parts of the Schedule of Values shall aggregate to the total Contract Sum.
2. The minimum level of breakdown will normally be:
  - a. General Conditions line item(s) as required
  - b. Construction costs, by CSI Division or major trade, and broken down into labor and material line items for specific areas of the facility
  - c. Stored material projections
3. Schedule of Values items shall have a direct and understandable relation to the Project CPM Schedule.

### 2. SCHEDULE OF VALUES UTILIZATION

#### A. Applications for Payment

The Schedule of Values, unless objected to by the Construction Manager or the Architect, shall be the basis for the Contractor's Applications for Payment.

#### B. Changes to the Schedule of Values

The Construction Manager shall have the right to require the Contractor to alter the value or add/delete categories listed on the Schedule of Values at any time for the following reasons:

1. The Schedule of Values appears to be incorrect or unbalanced.

2. A revision to the segregation of values is required due to the Contractor revising the sequence of construction or assembly of building components, which in turn invalidates the Schedule of Values.
3. Change Orders are issued to the Contractor and require incorporation into the Schedule of Values.

C. Stored Materials

The Contractor is required to correlate the documentation for payment of stored materials requested in the Application for Payment against the agreed upon breakdown of the Schedule of Values. The Construction Manager reserves the right to not process the Application for Payment if this correlation has not been submitted in conjunction with the Application.

**END OF SECTION 01 370, SCHEDULE OF VALUES**

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## SECTION 01 400 – QUALITY CONTROL

### 1. GENERAL

- A. Refer to the Technical Specifications for specific quality control activities to be performed, and for the inspection and testing required by public authorities having jurisdiction.
- B. The Contractor shall furnish all labor, materials, tools, equipment and services for quality control of materials, components and systems incorporated or to be incorporated the Work, so as to adequately and acceptably perform the Work as required by the Contract Documents. All testing and inspection, whether required by the Contract Documents; by laws, ordinances, rules, regulations, codes or orders of any public authority having jurisdiction; or whether performed by the Contractor for qualification of materials or its convenience, shall be at the Contractor's expense unless otherwise indicated in the Contract Documents.
- C. The Contractor shall be fully responsible for quality control. The Contractor shall employ an individual on its staff who shall be primarily responsible for ensuring an acceptable level of quality on the Project. This individual shall not be the Contractor's Project Superintendent.
- D. The Contractor shall completely coordinate its Work internally and with the work of any separate contractors. Although such Work may not be specifically indicated in the Contract Documents, the Contractor shall furnish and install all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation.
- E. At any time during the execution of the Contract, the Construction Manager may notify the Contractor that some aspect of quality control is not being correctly performed. If the Contractor fails to respond to a request for quality control surveys or reports, or to a second request for proper preparatory work in an area for the purpose of a test or inspection, including a punch list inspection, the Construction Manager or the County may provide this work and deduct the cost of such work from the value of the Contract.

### 2. SPECIAL INSPECTIONS TESTING

- A. Special Inspections for the Fairburn Senior Center project will be performed by a consultant to Fulton County.
- B. The Special Inspections consultant will provide a Schedule of Special Inspections and a stamped and dated Statement of Special Inspections for this project, per the Standard Building Code requirement for Special Inspections fro this project.
- C. Services shall include, at a minimum:
  - 1. Soils (compaction, moisture content, below pavement, foundations and slabs)
  - 2. Paving (compaction, moisture content)
  - 3. Concrete work (subgrade preparation, reinforcement and concrete)
  - 4. Masonry/reinforced masonry
  - 5. Structural steel connections (bolts and welds)
- D. The contractor will be required to submit a Statement of Contractor's responsibility, per IBC 1705.3, to Fulton County Department of Environment and Community Development, to include:

1. Acknowledgement of awareness of the special requirements contained in the quality assurance plan.
2. Acknowledgement that control will be exercised to obtain conformance with the construction documents approved by the building official.
3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting, and the distribution of the reports.
4. Identification and qualifications of the person (s) exercising such control and their position (s) in the organization.

### **3. OTHER REQUIRED TESTING AND INSPECTION**

The Contractor shall be responsible for all other tests and inspections which may be required, including, but not limited to testing and certification of conveyances, mechanical systems (including balancing), electrical systems, fire alarm and security systems, and other special systems, any of which may or may not require the use of an independent testing and inspection agency.

### **4. JOB CONDITIONS**

- A. Employment of an independent testing and inspection agency shall not relieve the Contractor of its obligation to comply with the Contract Documents.
- B. Where operating tests are specified, the Contractor shall test its Work as it progresses, at its own expense, and shall make satisfactory preliminary tests in all cases prior to applying for official tests. Tests shall be in the manner specified for the appropriate type of Work.
- C. Each test shall be made on the entire system for which such test is required wherever practical. In case it is necessary to test portions of the Work independently, the Contractor shall do so without additional compensation. Should defects appear, they shall be corrected by the Contractor and the test repeated until the installation is acceptable to the Architect and the Construction Manager. No Work of any kind shall be covered or enclosed before it has been tested and approved.

### **5. PROCEDURES AND REPORTS**

- A. Prior to the start of construction, submit to the Construction Manager a complete list of proposed tests and inspections according to specification section and Schedule of Special Inspections.
- B. Perform, or cause to be performed, all required inspections, sampling and testing of materials and methods of construction, utilizing methods required by the specifications and applicable standards. The Contractor's quality assurance specialist shall observe all sampling and testing and shall review all test results.
- C. Test procedures:
  1. Each test to be performed shall have a test procedure which shall include a detailed description of the specific steps which will be taken by the testing technician.
  2. Each test procedure shall be submitted to the Construction Manager for review at least four (4) weeks prior to the time that the Contractor wishes or is required to perform the test.
  3. No formal acceptance test will be performed without an approved test procedure being utilized.

- D. Report each test/inspection/sampling in the form specified below. All reports shall be submitted promptly after completion of the test.
  - E. Retest all failed materials, components, and systems.
  - F. Record all test and inspection results and maintain a complete log of the testing and inspection program. This log shall be submitted for the Architect's or the Construction Manager's review upon request.
  - G. Equipment testing:
    - 1. All pieces of rotating mechanical equipment and electrical equipment shall be formally tested prior to acceptance by the Architect, the Construction Manager and the County. This requirement will not be waived by temporary or permanent occupancy of some or all parts of the finished construction.
    - 2. The Construction Manager shall have the final determination as to whether or not a piece of equipment shall require a formal acceptance test.
    - 3. No equipment warranty period shall be started until a formal acceptance test has been successfully completed.
    - 4. No final payment for any such equipment shall be made until a formal acceptance test has been successfully completed.
  - H. Test / inspection procedures and reports shall include the following information at a minimum:
    - 1. Project name and number
    - 2. Project location
    - 3. Applicable specification section and paragraph
    - 4. Type of test or inspection
    - 5. Name of testing/inspecting agency (if used)
    - 6. Name(s) of testing/inspecting personnel
    - 7. Date of test/inspection
    - 8. Record of field conditions encountered, including weather
    - 9. Observations regarding compliance
    - 10. Test method used
    - 11. Results of test/inspection
    - 12. Date of report
    - 13. Signature of testing/inspecting personnel
  - I. Where test/inspection reports indicate non-compliance, provide report on colored bond paper.
  - J. All testing/inspection reports produced by an independent testing and inspection agency shall be submitted to the Construction Manager directly from the independent testing and inspection agency, with copies to the Contractor.
- 6. SPECIAL INSPECTION TESTING AGENCY DUTIES AND LIMITATIONS OF AUTHORITY**
- A. Provide qualified personnel at site after due notice; cooperate with the Contractor, the Architect, and the Construction Manager in performance of services.
  - B. Promptly notify the Construction Manager of irregularities or non-conformance of Work which are observed during performance of services.

- C. Attend preconstruction conferences and progress meetings if an as requested by the Construction Manager.
- D. An independent testing and inspection agency is not authorized to:
  - 1. Release, revoke, alter, or enlarge on requirements of the Contract Documents.
  - 2. Approve or accept any portion of the Work.
  - 3. Assume any duties of the Contractor.
  - 4. Stop the Work.

**7. CONTRACTOR'S DUTIES TO SPECIAL INSPECTION OR INDEPENDENT TESTING AND AGENCY**

- A. The Contractor shall be responsible to coordinate all work of the testing and inspection agency including notifications, coordination on and off site and distribution of test reports.
- B. The Contractor shall cooperate with testing and inspection agency personnel, and provide access to Work.
- C. The Contractor shall provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.
- D. The Contractor shall notify the testing and inspection agency and the Construction Manager of any test or inspection 48 hours in advance to allow for proper coordination,
- E. Unless noted otherwise, field testing procedures shall be performed by the Contractor under the direction and observation of the independent testing and inspection agency.

**8. MOCK-UPS**

- A. Provide mock-ups and testing for Work as required by the Contract Documents.
- B. Build mock-ups to be used as specimens for visual inspection or testing. Use the same materials, finishes, details, methods and anchorage system proposed for the respective installations. Simulate actual construction conditions. Provide extra materials as may be required to replace any which fail during tests, except intentional failure tests beyond specified performance requirements.
- C. Schedule erection and approval inspections of mockups in the construction schedule.
- D. For waterproof or watertight assemblies, assemble and erect complete, with specified attachment and anchorage devices, flashings, seals, and finishes.
- E. Correct any deficiencies and repeat tests as may be required to show compliance with the Contract Documents. Incorporate corrective measures into the final system assembly.
- F. Remove mock-up and clear area when work of that section is complete, when approved by the Architect, County and/or Construction Manager.

## **9. PUNCH LIST INSPECTIONS**

The preparation of the Work or a portion thereof prior to a punch list inspection shall be solely the Contractor's responsibility. The Contractor shall first verify, and then certify that the Work for which a punch list inspection is being requested is in such a state that it may be easily punched out for acceptance by the Architect, the Construction Manager and/or the County. Failure to properly prepare the Work for a punch list inspection shall constitute a failure to perform a quality control duty, and the Construction Manager may take appropriate action as defined in Paragraph 1.E above.

**END OF SECTION 01 400, QUALITY CONTROL**



## SECTION 01 500 – CONSTRUCTION FACILITIES & TEMPORARY CONTROLS

### 1. INTRODUCTION

- A. The Contractor shall provide all construction facilities and temporary controls throughout the construction period unless otherwise indicated in the Contract Documents.
- B. The Contractor shall pay all costs for providing, maintaining, and removing all construction facilities and temporary controls unless otherwise indicated in the Contract Documents.

### 2. QUALITY ASSURANCE

All work specified herein shall be performed in a workmanlike manner and shall be in accordance with applicable codes, OSHA regulations, utility company rules and regulations, and other rules and regulations of any other authorities having jurisdiction.

### 3. JOB CONDITIONS

- A. The Contractor shall establish and initiate use of each construction facility or temporary control at the time first reasonably required for proper performance of Work. Terminate use and remove facilities and controls at earliest reasonable time, when no longer needed or when permanent facilities have, with authorized use, replaced the need.
- B. The Contractor shall install, operate, maintain and protect construction facilities and temporary controls in a manner and at locations which will be safe, non-hazardous, sanitary and protective of persons and property, and free of deleterious effects.
- C. Conservation: In compliance with County policy on energy/materials conservation, install and operate construction facilities and temporary controls and perform construction activities in a manner which reasonably will be conservative and avoid waste of energy and materials, including water and electric power.

### 4. TEMPORARY UTILITIES - GENERAL

- A. The Contractor shall provide and pay all costs for temporary utilities, including consumption costs. Do not use utilities of any existing, permanent operations at site.
- B. Make all temporary connections to utilities and services in locations acceptable to the local authorities having jurisdiction. Furnish all necessary labor and materials, and make all installations in a manner subject to the acceptance of such authorities.
- C. Maintain all temporary utility installations connections and remove them when no longer required. Restore the services and sources of supply to proper operating condition.
- D. The Contractor may extend and use permanent utilities installed for the Project for temporary facilities. Prior to Substantial Completion, remove temporary connections, replace lamps, filters, etc., and restore permanent utilities to specified condition.
- E. Metering: Comply with requirements of local utilities for installation of meters for water and electrical power services.

## 5. TEMPORARY POWER DISTRIBUTION

- A. Temporary electrical power service shall be installed and maintained such that power can be secured at any desired point with no more than a 60 foot extension cord.
- B. Service shall be sufficient for the following items:
  - 1. Power centers for miscellaneous tools and equipment used in the construction work, each with a minimum of four 20-amp, 120 volt grounding type outlets. Each outlet shall provided with ground fault detecting circuit breaker protection.
  - 2. Adequate lighting for safe working conditions, provided and maintained on a 24-hour basis, throughout the building including stairways. At least 0.25 watts of incandescent lighting per square foot for general use must be installed and maintained in all areas where work is in progress. Each lamp must be rated at least 100 watts. Voltage of each socket must be at least 110 volts.
  - 3. Power for any equipment used for temporary heating and ventilation, and for start-up testing of any permanent electric-powered equipment prior to its connection to permanent electrical system.
- C. Power for electric welding shall be provided via the temporary electrical system or engine-driven power generator sets. Coordinate all connections for welding equipment with the Construction Manager.
- D. Regulatory Agency Requirements:
  - 1. The Contractor shall obtain any and all permits required by local authorities having jurisdiction, as applicable to any temporary power work performed.
  - 2. The temporary electrical service shall comply with the National Electrical Code as currently adapted by local authorities, and all other applicable local codes and utility regulations.
- E. Materials:
  - 1. The materials may be new or used, but must be adequate in capacity for the purposes intended and must not create unsafe conditions or violate the requirements of applicable codes.
  - 2. Use wire, cable, or busses of appropriate type, sized in accordance with the National Electrical Code for the applied loads. Use only UL-labeled wire and devices.
- F. Equipment: Provide appropriate enclosures for the environment in which equipment is placed and used, in compliance with NEMA standards.
- G. Installation:
  - 1. Install all work with a neat and orderly appearance.
  - 2. Make the work structurally sound throughout.
  - 3. Maintain the system to give continuous service and to provide safe working conditions.
  - 4. Modify temporary power and lighting installation as job progress requires.
  - 5. Locate work such that interference with storage areas, traffic areas and other work is avoided.

6. Remove all temporary equipment and materials completely upon completion of construction.
7. Repair all damage caused by the installation and restore to satisfactory condition.

#### 6. TEMPORARY LIGHTING

- A. Provide task lighting of sufficient level for installation of the Work. If the Construction Manager does not deem the amount of task lighting to be adequate in a given area, the Contractor shall immediately increase the amount of task lighting at no additional cost. Verbal direction for the Construction Manager shall be adequate in this situation.
- B. Lighting at all interior areas receiving final finishes shall be at uniform levels and generated from the same type and color lamps.
- C. Lighting for field offices, storage trailers, shops and outdoor work areas shall be provided by the Contractor as necessary.
- D. Outdoor area lighting, in excess of any existing streetlight levels, of any site staging areas shall be provided by the Contractor. This lighting shall be in the form of dusk-to-dawn mercury vapor fixtures. Lighting shall be of sufficient levels to permit security checks of the areas and provide for minimal access, but not sufficient by itself for work activity. If the Construction Manager does not deem the amount of area lighting to be adequate in a given area, the Contractor shall immediately increase the amount of area lighting at no additional cost.

#### 7. TEMPORARY WATER

- A. Water for Construction: Construction water may be provided from available existing water mains or by use of temporary tanks. When connecting to existing water service lines, perform all work according to the requirements of, and obtain any and all permits required by, local authorities having jurisdiction. Remove all temporary installations and equipment upon completion of construction.
- B. Drinking Water: Provide drinking water adequate in quantity, quality and locations for all personnel at the project site. Furnish paper drinking cups and waste receptacles at each drinking water dispensing location.

#### 8. TEMPORARY HEAT AND VENTILATION

- A. The Contractor shall be responsible for providing heating and ventilation where required for satisfactory execution of the Work. Specifically, temporary heating and ventilation is required to:
  1. facilitate progress of the Work
  2. protect materials from dampness and the adverse effects of low ambient temperatures
  3. prevent moisture condensation on surfaces
  4. provide suitable temperature and humidity levels for installation and curing of materials
- B. Temperature Requirements:
  1. Generally, in semi-finished areas, a minimum of 50 degrees F shall be maintained 24 hours per day.

2. During placing, setting, and curing of cementitious materials, temperatures shall be maintained as required by the Technical Specifications and applicable standards.
  3. Seven (7) days prior to, and during, the installation of interior finishes, the minimum temperature shall be 50 degrees F, 24 hours per day, unless noted otherwise in specific sections of the Technical Specifications.
  4. After application of interior finishes and until the permanent HVAC system is operable, the minimum temperature shall be 50 degrees F, 24 hours per day, except as otherwise noted in the specific sections of the Technical Specifications and unless higher temperatures are required for specific activities; then the temperature shall be maintained as per the specific material manufacturer's recommendations.
  5. Concrete Work: During the winter months (November through April), the Contractor shall provide winter weather protection for all concrete work if required. The heating may be accomplished by use of approved types of portable heaters. Review applicable sections of the Technical Specifications for specific cold weather requirements for concrete placement and curing.
- C. Use steam or hot water for temporary heating if and when available. If steam or hot water is not available, use gas from a piped distribution system if and when available. If none of the above sources are available, portable self-contained LP gas or fuel oil heaters may be used, equipped with individual space thermostatic controls.
- D. The Contractor shall provide heat as required for any work area outside the building confines.
- E. Safe Practices for Portable Heaters:
1. Locate heating units so as not to create a hazard to personnel, stored materials, or work of other contractors.
  2. Avoid locating heaters in the vicinity of volatile, combustible, or explosive materials.
  3. Ventilate areas occupied by personnel to avoid dangerous levels of exhaust gases and consumption of oxygen.
  4. Use heating units bearing UL, FM or other approved label(s) appropriate for application.
- F. Install all temporary heating and ventilation work in a workmanlike manner, and ensure all work complies with rules and recommendations of involved local utility company, if applicable, as well as OSHA requirements.

## 9. TEMPORARY FIRE PROTECTION

- A. Specific administrative and procedural minimum actions are specified in this Paragraph, as extensions of provisions in the Owner-Contractor Agreement and other Contract Documents. These requirements have been included for special purposes as indicated. Nothing in this Paragraph is intended to limit types and amounts of fire protection required, and no omission from this Paragraph will be recognized as an indication by the County or Construction Manager that such temporary activity is not required for successful completion of the Work and compliance with requirements of Contract Documents.
- B. Quality Assurance

1. NFPA Code: Comply with NFPA Code 241 "Building Construction and Demolition Operations."
  2. The Contractor shall also comply with all applicable state, city and local fire codes.
- C. The Contractor shall take all necessary precautions to guard against all possible fire hazards and to prevent damage to any construction Work, building materials, equipment, field offices, storage sheds and all other property, both public and private, in accordance with all fire protection and prevention laws and codes. The Contractor will assume full responsibility for damage caused by fire to construction and building, building materials, equipment and all property, both public and private.
- D. The location of the nearest corporation or public fire alarm box and the number of the local fire department shall be conspicuously posted by the Contractor in its field office and in the construction area.
- C. The Contractor's superintendent in charge of the Work shall review the Project at least once a week to make certain that it adheres to the conditions and requirements set forth herein.
- D. No open fires shall be permitted. The Contractor and its subcontractors will not be allowed to start fires with gasoline, kerosene or other flammable materials. The bulk storage of all flammable liquids shall be located at least 75 feet from any inhabited trailer or office and from the yard storage of flammable building materials. All flammable liquids having a flash point of 100 degrees F or below, which must be brought into any building, shall be confined to the Underwriter's Laboratories' labeled safety cans. Drums containing flammable liquids are to be equipped with approved vent pumps and located per direction of the Construction Manager. Drums with spigots are prohibited for the storage of flammable liquids on the project site.
- E. Welding, flame cutting or other operations involving the use of flame, arcs or sparking devices will not be allowed without adequate protection and shielding. All combustible and flammable material shall be removed from the immediate working area. If removal is impossible, all flammable or combustible material shall be protected with a fire blanket or suitable noncombustible shields to prevent spark, flames or hot metal from reaching the flammable or combustible materials. The Contractor shall provide the necessary personnel and fire fighting equipment to effectively control incipient fires resulting from welding, flame cutting or other operations involving the use of flame, arcs or sparking devices.
- F. Only fire resistant tarpaulins with UL label and flame spread of 15 or less shall be used on this project.
- G. Use of only Underwriters Laboratory approved heaters and/or stoves is permitted in field offices or storage sheds and they shall have fire resistive material underneath and at the sides near partitions and walls. Pipe sleeves and covering shall be used where stove pipe runs through wall or roof.

- H. Smoking shall be prohibited around concentrations of combustibles and in particularly hazardous areas. Restricted areas must be plainly marked, with signs posted. No smoking rules must be strictly enforced.
  
- I. Fire Extinguishers
  - 1. The Contractor shall provide and maintain in working order during construction, an adequate number of fire extinguishers for use by all trades in each area of work. Two (2) fire extinguishers shall also be placed in the vicinity of Contractor's construction office.
  - 2. In areas of flammable liquids, asphalt or electrical hazards, extinguishers of the 15 lb. carbon dioxide type or 20 lb. dry chemical type shall be provided.
  - 3. The Contractor shall maintain and inspect all fire extinguishers periodically. Fire extinguishers must be mounted in plain view and sealed, so that operation of the fire extinguisher will break the seal. In the event a fire extinguisher is discharged or damaged, it shall be removed from service and be replaced with a charged unit.
  - 4. The Contractor shall post warnings and quick instructions at each extinguisher location. The Contractor and all of its subcontractors shall instruct their personnel at the project site, at the time of their first arrival, on proper use of extinguishers and other available facilities at the project site.

## 10. DEWATERING

Maintain the Project site and all Work free of water accumulation. Dewatering activities shall not infringe upon adjacent properties. Comply with all rules and regulations of authorities having jurisdiction and secure any and all permits required.

## 11. TEMPORARY ENCLOSURES

- A. Provide temporary enclosures reasonably required to ensure adequate workmanship and protection from the weather and unsatisfactory ambient conditions for the Work, including those enclosures inside which temporary heat is used.
- B. Provide fire-retardant treated lumber and plywood where used for temporary enclosures.

## 12. TEMPORARY SANITARY FACILITIES

- A. Provide and maintain sanitary toilet facilities for use of all personnel at the project site. Either piped (wet) toilet facilities or self-contained chemical toilet units may be used.
- B. The number of sanitary facilities required shall be based on the total number of workers employed on the site and shall be in accordance with the provisions of the applicable code. Separate toilet facilities for men and women shall be provided when both sexes are working in any capacity on the project site.

- C. All sanitary facilities shall be maintained by the Contractor in a safe, clean, and sanitary conditions at all times.

### 13. CONSTRUCTION TRAFFIC INGRESS TO AND EGRESS FROM SITE

- A. Routes to Construction Site: The Contractor shall inform and insure compliance of its subcontractors and suppliers regarding the recommended traffic route(s) from major highways to the jobsite. For all traffic off of the jobsite, the Contractor shall coordinate with, and obtain any necessary permits from, appropriate authorities having jurisdiction.
- B. Construction Site Access: All construction traffic, including deliveries of materials and equipment, shall enter and exit the site only by the routes prescribed on a site access and parking plan submitted by the Contractor and approved by the Construction Manager prior to start of construction (see Subparagraph 14.1 below).
- C. Cleaning: The Contractor shall take all precautions necessary to prevent the tracking of mud and debris onto paved roads adjacent to the jobsite. The Contractor shall immediately clean any affected area if directed by the Construction Manager. The utilization of wheel wash areas located at all site entrance/exit points is mandatory for all vehicles leaving the site if the tracking of mud or debris onto adjacent streets would result otherwise.

### 14. SITE ACCESS ROADS AND PARKING AREAS

- A. Provide and maintain vehicular access to and within the site for use by all persons and equipment involved in construction of the Project.
- B. New temporary access roads shall be constructed across designated easements from public thoroughfares only as allowable by local authority having jurisdiction.
- C. Provide adequate access for emergency vehicles.
- D. Provide and maintain temporary parking areas for use by construction personnel. Do not use any existing parking lots which may exist at existing facilities on the site unless specific authorization is given by the County. If parking needs exceed onsite capacity, provide offsite parking as necessary, as well as transportation to and from the site if distance dictates.
- E. All traffic and parking areas shall be filled, compacted, and graded as necessary to provide suitable support for vehicular traffic under anticipated loadings.
- F. Maintain all onsite traffic and parking areas free of excavated materials, construction equipment, construction materials, debris, snow and ice. Provide for surface drainage for all traffic and parking areas, and implement and maintain dewatering if and as necessary.
- G. Keep fire hydrants, water control valves, and all other utilities requiring possible access free from obstructions.
- H. Provide temporary directional signage as necessary.
- I. Prior to the start of construction, submit to the Construction Manager for approval a complete site access/utilization and parking plan, incorporating the requirements described above.

### 15. STORAGE AREAS

- A. The Contractor shall be responsible for all onsite and offsite storage of materials and equipment required for the Project. Onsite storage is subject to the review and approval of the Construction Manager.

- B. All combustible or flammable materials shall be safely stored in a secured area in strict accordance with regulations, codes, and laws enforced by local, State, or Federal agencies, whatsoever is the most stringent.
- C. If the Construction Manager, for good reason, directs that any or all materials stored on the site must be removed, the Contractor shall do so within ten (10) days of written notice of same. Stored materials not removed in a timely manner will be removed by the Construction Manager at the Contractor's expense.

#### 16. TEMPORARY FIELD OFFICE AND TOOL STORAGE FACILITIES

- A. The Contractor shall provide a trailer or other suitable temporary building for a field office, which shall contain office space required for the Contractor's operations, a conference room of suitable size for regular progress meetings, toilet facilities, and a separate spare office for a County, Architect, or Construction Manager representative to use when onsite. Ample space shall be provided for storage of all construction documentation. The trailer shall have telephone service for use by the Contractor and its subcontractors, and shall also have a working intrusion alarm system. One sign with the Contractor's name may be placed on the trailer.
- B. The Contractor may provide other temporary trailers or buildings for storage and maintenance as required and as space permits.
- C. All field office and storage structures shall be placed or constructed in accordance with the regulations of the local Fire Marshal having jurisdiction.
- D. Field offices and sheds shall be of suitable design, maintenance, and appearance.
- E. The Contractor shall provide power and heat to its field office, and to storage sheds if storing climate-sensitive materials or equipment.
- F. The Contractor shall adequately maintain the designated space designated for its field office and storage sheds, including the removal of weeds, debris, and trash.
- G. Temporary field offices and sheds shall not be used for living quarters.
- H. If the Construction Manager, for good reason, directs that any or all field offices or storage sheds on the site must be removed, the Contractor shall do so within ten (10) days of written notice of same. Structures not removed in a timely manner will be removed by the Construction Manager at the Contractor's expense.

#### 17. FIRST AID STATION

The Contractor shall provide and maintain at least one unmanned first aid station for its personnel and subcontractors.

#### 18. SECURITY

- A. Neither the County or any of its agents assumes any responsibility for loss, theft or damage to the Work, tools, equipment and/or construction. In the instance of any such loss, theft or damage, the Contractor shall be responsible to renew, restore or remedy the Work, tools, equipment and construction in accordance with requirements of the Contract Documents without additional cost to the County.
  - 1. The Contractor shall immediately advise the Construction Manager of any theft or damage which may delay the execution of the Work.

2. The Contractor shall furnish the Construction Manager with a copy of any theft report filed with appropriate law enforcement agencies.
- B. Site parked equipment, operable machinery and hazardous parts of the new construction subject to mischief and accidental operation shall be inaccessible, locked or otherwise made inoperable when left unattended.
- C. The Contractor shall utilize specific entrances for material deliveries, equipment deliveries, and worker access to the construction site as indicated on its site access/utilization plan and approved by the Construction Manager.
- D. The County or Construction Manager, as the Project progresses, may establish additional security policies and procedures. The Contractor shall cooperate with the County and/or Construction Manager in implementing such additional procedures.

#### 19. TEMPORARY SIGNAGE

- A. Project Sign: The Contractor shall construct, erect and maintain one (1) 4 foot by 8 foot project sign of  $\frac{3}{4}$  inch (minimum) exterior grade plywood, given two coats of paint and mounted securely on two 4 inch by 4 inch posts set 30 inches (minimum) into the ground. The sign shall be clearly lettered by one skilled in the sign trade with the facility name, address, County logo, names of County Commissioners, the County Manager and other County representatives, Contractor name, major subcontractors' names, and the jobsite telephone number. Locate the project sign as designated by the Construction Manager. Avoid a placement that may inhibit safe entry or exit from the site. Verify sign content with County, through the Construction Manager, prior to procuring and erecting the sign.
- B. No other signs or advertising shall be displayed on the premises without the approval of the Construction Manager, other than the posting of required notices and cautionary signage by the Contractor, and signage on equipment and trailers to designate ownership.

#### 20. TRASH / DEBRIS DISPOSAL

- A. The Contractor shall provide dumpsters sufficient to hold site waste from its operations and that of its subcontractors, and shall remove same from the jobsite on a regular basis.
- B. Debris such as soil waste, concrete, steel, or other bulky items from excavation and/or demolition work not disposed of in dumpsters shall be removed and disposed off-site by appropriate means. Methods of debris removal and disposal shall be reviewed with the Construction Manager.

#### 21. SITE CLEANING

- A. The Contractor shall be responsible for the maintenance of a clean, neat and safe project site. The Construction Manager is hereby placing the Contractor on notice that failure to clean up on a weekly basis will immediately result in the Construction Manager bringing in labor to perform this task and deducting the cost of such measures from the Contract Sum. The Construction Manager shall be the sole authority which shall determine the amounts to be deducted from the Contractor's contract for this type of cleaning.
- B. The Contractor shall assign at least five (5) percent of his own and his subcontractors' work forces to clean-up activities for at least four (4) hours per week, or as deemed necessary by the Construction Manager.
- C. No exceptions to these rules will be allowed. Failure to immediately adhere to all of the Construction Manager's directions in this regard will result in the holdup of Contractor's progress payments until compliance with these rules are obtained.

## 22. MISCELLANEOUS CONSTRUCTION FACILITIES

- A. The Contractor shall be responsible for providing and maintaining its own scaffolding and for conforming with all safety regulations related thereto.
- B. The Construction Manager retains the right to inspect all erected scaffolding, and to request written verification from an inspection agency as to the soundness of erected scaffolding to perform its intended function. However, the Construction Manager assumes no responsibility to do so, or of the results of such inspections.
- C. Except as otherwise provided, the Contractor shall provide and maintain all necessary temporary stairs, ladders, ramps and runways to facilitate conveyance of men, materials, tools, and equipment for proper execution of the Work.
- D. All protection and safety barricades, devices, covers, etc., shall be provided by the Contractor as it relates to the safe conduct of his work in accordance with OSHA requirements.
- E. The Contractor shall maintain safe temporary access to the work as construction progresses.
- F. All barriers and barricades shall comply with OSHA or other applicable safety requirements of the Project. All barriers and barricades shall be installed in a manner that will allow for the continued progress of the Work. Installation and removal of barriers, barricades and railings will be monitored by the Construction Manager.
- G. If the Contractor or any subcontractor, who in the course of its work, creates a hazard, it is responsible for providing, at its own expense, all required protection, including all safety barriers, barricades and perimeter protection as necessary.
- H. If any safety protection is required to be temporarily removed during the progress of the Work, it shall be reinstalled at the completion of the specific activity requiring such removal, and in a manner that provides a level of compliance equal to the initial installation.
- J. The Contractor shall enclose all construction areas in such a manner so as to protect the public from injury and in accordance with authorities having jurisdiction
- K. Provide any other types of construction facilities as may be reasonably required for performance of the Work and accommodation of personnel at the project site, including the County's and Construction Manager's personnel.

**END OF SECTION 01 500, CONSTRUCTION FACILITIES & TEMPORARY CONTROLS**

## SECTION 01 560 – ENVIRONMENTAL PROTECTION

### 1. GENERAL

- A. Provide all facilities, establish procedures, and conduct construction activities in a manner which will ensure compliance with the County's environmental requirements and other regulations controlling construction activities at the Project site.
- B. Definitions:
  - 1. Sediment: Soil that has been eroded and transported by runoff water.
  - 2. Degradable Debris: Debris which can undergo biodegradation or combustion, or which can be dissolved in or suspended by water.
  - 3. Non-degradable Debris: Inorganic debris which will not disintegrate nor dissolve when exposed to moisture or water.
  - 4. Chemicals: Petroleum or cementitious products, bituminous materials, salts, acids, solvents, alkalis, herbicides and pesticides.
  - 5. Waste: Sewage, including domestic sanitary sewage, garbage and trash resulting from food and food packaging.

### 2. PRODUCTS

- A. General: Products, devices and materials shall be approved by authorities having jurisdiction.
- B. Earth Stabilizer: Rye grass seed, hay, straw mulch, chemical stabilizer or any other device approved by authorities having jurisdiction.
- C. Hay Bales: Type and size as recommended by environmental protection authorities having jurisdiction.
- D. Silt Fence: Type and size as recommended by land disturbance and environmental protection authorities having jurisdiction.

### 3. ENVIRONMENTAL PROTECTION PROCEDURES

- A. General
  - 1. In the means and methods of construction, and in the coordination and control of the Work at the site, establish and enforce ecological preservation standards which avoid pollution of the atmosphere, waterways and vegetation.
  - 2. Conform to laws, ordinances, restrictions, and rules of governmental bodies having enforcement power in regard to site preservation and erosion control.

3. Prevent droppings of petroleum products, cementitious waste and chemical substances on the ground or into storm, sanitary drains or waterways.
  4. This Section may be supplemented by notes on drawings relative to environmental protection.
  5. In performing sitework, provide and maintain protection during sitework for all existing lawns, trees, curbs, gutters, hydrants, light standards, drives, walks, street signs and buildings not noted for removal. Damaged items shall be repaired or replaced.
  6. The Contractor shall designate one person, the Superintendent or other, to enforce strict discipline on activities related to generation of wastes, pollution of air/water, generation of noise and similar harmful or deleterious effects which might violate regulations or reasonably irritate persons at or in vicinity of the Project site.
  7. Take special precautions when working on floors directly above or below any occupied floors and adjacent to circulation or vehicular circulation. Minimize noise, dust, or other environmental hazards to spaces.
- B. Noise Control
1. Provide mufflers on combustion engine powered equipment to minimize noise.
  2. Blasting is strictly prohibited without written permission from first the Construction Manager and then all applicable State and Local regulatory agencies.
- C. Air Quality Control: Maintain acceptable air quality at all times. Acceptable air quality shall also be maintained in any existing, operating buildings or structures during construction operations that require physical connection to such buildings or structures so as to not interfere with any existing operations.
- D. Water Control
1. All pumping, bailing, or well point equipment necessary to keep excavations free from the accumulation of water during the entire progress of the Work shall be the responsibility of the Contractor.
  2. Keep the building or portions thereof free from water ingress due to construction operations at all times until Final Completion of the Work.
  3. Provide all pumping necessary to keep site utility lines, sewers, manholes and meter pit excavations and mass excavation free from water.
  4. Dispose of water in such a manner as will not endanger public health or cause damage or expense to public or private property. Abide by the requirements of all public authorities having jurisdiction.
- E. Dust Control
1. Effectively confine dust, dirt and noise to the actual construction area(s) until Substantial Completion of the Work.

2. Clean up operations shall be by vacuuming, wet mopping, wet sweeping, or wet power brooming. In sandblasting operations, if any, confine the dust.
3. Use wet-cutting methods for cutting concrete, asphalt, and masonry. Do not shake out bags containing cement, lime, and other dust-causing substances.
4. Do not leave areas of disturbed earth unworked for long periods of time. As the earth is disturbed, continue the work to achieve temporary or permanent earth stabilization promptly.
5. Keep dust down at all times, including non-working days, weekends and holidays. Temporary methods consisting of water sprinkling or similar methods will be permitted to control dust. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding and pollution.
6. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs.

**F. Snow and Ice Removal**

1. Arrange for removal of snow and ice in and about the premises, as necessary to conform with local regulations on public sidewalks adjacent to the site, and as necessary on and about the site and the Work to permit safe access to continue or perform work.
2. When performing work under exposed conditions, remove snow and ice for the protection and execution of the Work.

**G. Controls During Earth Moving**

1. Perform earth moving in such phases which minimize the area extent of exposed land.
2. Control the rate of water runoff by diversion ditches, benches, berms and other earth-formed shaping so the rate of flow is retarded and silting minimized. Reshape and restore conditions showing evidence of earth erosion without delay.
3. Stabilize disturbed earth with temporary seeding or temporary mulching, or other effective temporary means, such as a stabilizing sprayed application or anchored netting.
4. Establish and enforce the use of tarpaulin-covered dump trucks and avoid overfilling so that spillage of earth and other matter into highways and streets does not occur.

**H. Vermin Control: Control vermin during the construction period. If vermin are encountered, provide extermination arrangements as necessary.**

**I. Disposal of Debris, Chemicals and Waste**

1. Dispose of debris, chemicals, and waste off the site in compliance with Federal, State and local laws and regulations.
2. Collect and contain materials before disposal in an orderly fashion and by means which prevent contamination of air, water and soil.

3. Store chemicals in watertight containers.
  4. Degradable debris, not contaminated by chemicals, e.g., leaves, tree limbs, twigs and logs, may be shredded on site and used as mulch. Exclude paper, cementitious waste, and material which could cause contamination of waterways. Non-degradable and degradable debris in excess of the above shall be disposed of off the site.
  5. Do not burn materials on the site.
- J. Clean-Up and Restoration of the Site
1. Maintain the site in good order through periodic pick up and clean-up of construction waste and wind-borne trash. Dispose of all waste and trash in tightly covered containers and schedule regular removal of trash and waste from the site.
  2. Existing sitework damaged during construction shall be restored to good and acceptable condition.
- K. Damage from Storms: Secure the site to avoid damage to the Work and stored materials, as well as damage to adjacent property.

**END OF SECTION 01 560, ENVIRONMENTAL PROTECTION**

## SECTION 01 610 – MATERIAL & EQUIPMENT HANDLING

### 1. GENERAL SUMMARY

- A. Deliver, handle and store materials and equipment in accordance with manufacturer's recommendations and by methods and means which will prevent damage, deterioration and loss, including theft. Provide delivery/installation coordination to ensure minimum holding or storage times for products recognized to be flammable, hazardous, easily damaged or sensitive to deterioration, theft and other sources of loss.
- B. Prior to starting work, the Contractor shall meet with the Construction Manager to determine the use of available areas for site offices and storage.
  - 1. The Contractor shall confine his equipment, the storage of material and the operations of his workmen to limits indicated by the Contract Documents, laws, ordinances, permits or directions of the Construction Manager.
  - 2. Neat and orderly stockpiling of all materials shall be maintained.
  - 3. Materials which require significant amounts of storage space, as determined by the Construction Manager, shall be brought to the site in quantities no greater than required for two (2) weeks work.
  - 4. Delivery of materials shall be scheduled so as not to encumber the site with items which will not be required for a significant length of time.
- C. If at any time it becomes necessary to move material or equipment which have been stored during construction, the Contractor, when directed by the Construction Manager, shall move them to another location without charge.
- D. The Contractor shall not load or permit any part of the site or structures to be loaded with a weight that will endanger its safety.
- E. Storage of materials outside the limits of construction, but on the County's property, is strictly prohibited without written permission from the County through the Construction Manager.
- F. All costs relating to temporary storage and protection shall be borne by the Contractor or subcontractor requiring such storage and protection. The Contractor shall retain full responsibility for any form of damage or deterioration to stored materials and any form of damage or deterioration caused by materials to surrounding surfaces.

## **2. MATERIALS HANDLING PLAN**

The Contractor shall develop and submit to the Construction Manager for approval, at least ten (10) days prior to the start of construction on the site, a comprehensive materials handling plan. This plan shall take into consideration the following:

- A. Control delivery of materials to maintain the construction schedule.
- B. Coordination with any separate contractors.
- C. The County's operation of adjacent facilities, if any.
- D. Provisions for both vertical and horizontal transportation and utilization of material and personnel hoists, if required.
- E. Limitations on space available for storage.
- F. Requirements for handling and installation of large equipment.

## **3. VERTICAL TRANSPORTATION**

- A. The Contractor shall be responsible for providing vertical transportation for materials, equipment, and personnel if and as required for multi-story buildings or significant heights. Cranes, hoists, conveyors, and other equipment used for this purpose shall be placed/installed and maintained according to applicable codes and regulations of authorities having jurisdiction.
- B. Temporary hoists and permanent elevators used as construction lifts shall be provided with an operator at all times such equipment is in use.
- C. The Contractor shall cooperate with the County, the Construction Manager and any separate contractors in the event that hoists or elevators are required for use by such entities during the course of the Project.

## **4. MATERIAL AND EQUIPMENT REMOVAL**

- A. Any required cranes, hoists, conveyors and other equipment mobilized and utilized by the Contractor shall be removed from the site within ten (10) days after completion of the Work.
- B. Upon completion of the Work, or sooner if directed by the Construction Manager, the Contractor shall remove his temporary structures and sheds and place the areas in a clean and orderly condition.
- C. No materials or equipment shall be removed from the site without the permission of the Construction Manager.

**5. PASSAGE OF MATERIALS AND EQUIPMENT**

- A. Establish passage clearances required to deliver and install materials and equipment.
- B. In case of insufficient clearance for passage of materials and equipment, deliver and protect such equipment before confining construction is installed.
- C. If existing structures, equipment and systems must be removed or altered to provide access for new materials and equipment, engage those skilled in the respective trade to restore structures, equipment and systems to their original condition at no additional cost. Do not alter structure, equipment or systems without written approval of the Construction Manager.
- D. In lieu of altering structures to provide passage of materials and equipment, provide materials and equipment that can be disassembled, brought into the building, and reassembled.

**END OF SECTION 01 610, MATERIAL & EQUIPMENT HANDLING**



## SECTION 01 630 – PRODUCTS & SUBSTITUTIONS

### 1. GENERAL

- A. This Section covers mandatory provisions for requests for product substitution during the bid period, and submission of product information and for substitution procedures, after Contract award.
- B. Definitions:
  - 1. "Products" are defined to include purchased items for incorporation into the Work, regardless of whether specifically purchased for this Project or taken from the Contractor's stock of previously purchased products.
  - 2. "Materials" are defined as products which must be substantially cut, shaped, worked, mixed, finished, refined or otherwise fabricated, processed, installed or applied to form units of the Work.
  - 3. "Equipment" is defined as a product with operational parts, regardless of whether motorized manually operated, and particularly including products with service connections (wiring, piping, etc.).
  - 4. Definitions in this paragraph are not intended to negate the meaning of other terms used in the Contract Documents, including specialties, systems, finishes, accessories, furnishings, special construction and similar terms which are self-explanatory and have recognized meanings in the construction industry.

### 2. PRODUCT SUBSTITUTION APPROVAL (BID PERIOD)

- A. As part of the bidding process, contractors, subcontractors or manufacturers may request approval for product substitutions for items that are specified allowing "or equal".
- B. Only products submitted following the proper procedure, detailed in this section, and submitted by the deadline for the last Request for Information, will be reviewed and considered.

### 3. INITIAL PRODUCT SUBMISSION (AFTER CONTRACT AWARD)

- A. As part of the Submittal Register specified in Section 01 340 of the General Requirements, provide a list showing names of products together with the names of manufacturer of each and, where applicable, the name of the installing subcontractor.
- B. Only specified products will be reviewed, except as herein below provided for substitutions.

## 4. PRODUCTS

### A. General Product Compliances

1. The compliance requirements for individual products as indicated by the Contract Documents are multiple in nature and may include generic, descriptive, proprietary, performance, prescriptive, compliance with standards, compliance with codes, conformance with graphic details and other similar forms and methods of indicating requirements, compliance with all of same being a requirement.
2. The Contractor's options for selection of products are limited by the Contract Document requirements and by governing regulations, and are NOT controlled by industry traditions or procedures experienced by the Contractor on previous construction projects. Required procedures for the selection of product options include, but are not limited to, the following:
  - a) If material specified in the Contract Documents is not available on the current market, alternate materials may be proposed by the Contractor through the Construction Manager for Architect and County approval.
  - b) In the Contract Documents where a specific brand, make, or manufacturer is denoted, the intent is that it be considered the standard for establishing the style, type, character and quality level of the article desired, but not as a restriction in the selection process to the specific brand, make or manufacturer named.
  - c) Alternate brands, make of material, device or equipment which, in the opinion of the Architect, are recognized as the equal of that specified on the basis of quality, workmanship and economy of operation considerations and are suitable for the purpose intended may qualify for acceptance.
  - d) Standards, Codes and Regulations: Where only compliance with an imposed standard, code or regulation is required, selection from among products which comply with requirements including those standards, codes and regulations shall be at the Contractor's option.
  - e) Performance Requirements: Provide products which comply with the specific performances specified, and which are recommended by the manufacturer (in published product literature or by individual certification) for the application indicated. Overall performance of a product is implied where the product is specified with only certain performance requirements.
  - f) Prescriptive Requirements: Provide products which have been produced in accordance with prescriptive requirements, using specified ingredients and components, and

complying with specified requirements for mixing, fabricating, curing, finishing, testing and similar operations during the manufacturing process.

3. Visual Matching: Where matching with an established sample is required, final judgment of whether a product proposed by the Contractor matches the sample satisfactorily lies with the Architect. Where no product within the specified cost range is available for a satisfactory match that complies with requirements, comply with the provisions in the Contract Documents related to "Substitutions" and "Change Orders" for the selection of a matching product outside the established cost category or of a product not complying with requirements.
4. Visual Selection: Except as otherwise indicated, where specified product requirements include "...as selected from manufacturer's standard colors, patterns, textures..." or words of similar effect, the selection of manufacturer and basic product (complying with the requirements) is at the option of the Contractor with the subsequent selection of color, pattern and texture to be by the Architect.

B. Quality Assurance

1. Source Limitation: To the greatest extent possible for each unit of work, provide products, materials or equipment of a singular generic kind and from a single source.
2. Compatibility of Options: Where more than one choice is available as options for Contractor's selection of a product or material, select an option which is compatible with other products and materials already selected. Total compatibility among options is not assured by limitations within the Contract Documents, but must be provided by the Contractor. Compatibility is a basic general requirement of product and material selections.
3. Provide products and materials which are undamaged and unused at the time of installation, and which are complete with accessories, trim, finishes, safety guards and labels, maintenance instructions and other devices and details required for a complete installation and for the intended use and effect.
4. Standard Products: Where available, provide standard products of types which have been produced and used previously and successfully in similar applications on other projects.
5. Continued Availability: Where additional amounts of a product, by the nature of its application, are likely to be needed by the County at a later date for maintenance and repair or replacement work, provide a standard, domestically produced product which is likely to be available to the County at such later date.
6. Warranties and Guarantees: Warranties are in several categories including those indicated in the General Requirements and in the Technical Specifications.

C. Certification

1. Certification of compliance with specification performance standards and manufacturers' specifications and directions shall be furnished for any portion of the Work for which specific performance requirements and/or manufacturers' specifications are listed. The Contractor shall be responsible for securing two (2) copies of each certification as required and transmitting same to the Construction Manager.
2. Each item requiring certification shall be so noted and an affidavit must be filed singly to cover each specified material, installation, application and the like.

D. Certification of Compatibility: If requested, the material and equipment manufacturers shall certify in writing that:

1. Other manufacturers' materials and/or equipment coming in contact with their product are compatible with their product in every way and that the intended performance of the system in which their product is incorporated will not be affected as a result of such contact. Also, that a physical breakdown of their product by chemical reaction or otherwise will not occur as a result of such contact.
2. The combination of products by one manufacturer to make up the manufacturer's specified system will contribute to the performance of the system as intended, and will remain operational, reliable and durable. The manufacturer will be the source of routine maintenance and replacement parts.

E. Nameplates: Except as otherwise indicated for required approval 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 the exterior of the Work.

1. Labels: Locate required labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface which, in occupied spaces, is not conspicuous.
2. Equipment Nameplates: Provide permanent nameplate on each item of service-connected or power operated equipment. Indicate manufacturer, product name, model number, serial number, capacity, speed, ratings and similar essential operating data. Locate nameplates on an easily accessed surface which, in occupied spaces, is not conspicuous.

F. Reuse of Existing Material

1. Except where specified or approved in writing, materials and equipment removed from an existing structure shall not be used in the Work.

2. Where use of existing materials and/or equipment is specified or approved in writing, use special care in removing, handling, storing and reinstallation to assure proper function of same in the completed Work.

## 5. CONSIDERATION OF SUBSTITUTIONS

- A. The requirements for substitutions do not apply to specified Contractor options on products and construction methods. Revisions to Contract Documents, where requested by the County or the Architect, are "changes" and not "substitutions." The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities do not constitute "substitutions", nor do they constitute a basis for change orders, except as provided for in the Contract Documents. Otherwise, the Contractor's requests for changes in products, materials and methods of construction required by the Contract Documents are considered requests for "substitutions", and are subject to the requirements herein.
- B. Substitutions for a specified product will be considered only if the specified product is not obtainable, or if delivery date of all such specified products is such that the scheduled date of Substantial Completion of the Work will be delayed if the specified product remains a requirement. The latter cause shall only be considered if the Construction Manager is notified of this condition within thirty (30) days of the Notice to Proceed for the Contract, or if after order has been placed, circumstances beyond the Contractor's control, such as labor disputes affecting manufacture or delivery of product cause such a delay. Under no circumstances will a substitution be allowed for reasons of potential delay due to Contractor's failure to execute timely purchase orders with the vendor or subcontractor, or due to Contractor's failure to submit product data or shop drawings in adequate time to allow for review and possible re-submittal prior to the required delivery date.
- C. Qualifications (during Bid Period): Substitutions will only be considered if the specifications denote "or equal" acceptance, and based upon the Contractor's, Subcontractor's or Manufacturer's representation that by submitting any Request for Substitution, they:
  1. have researched the proposed substitution and has determined that it is equivalent to or superior in all respects to that specified.
  2. confirm that the same warranties or bonds apply for the substitution as for the specified product, material, system and/or construction method.
  3. identify all coordination issues resulting from the installation of any accepted substitution into the Work.
- D. Qualifications (after Contract Award): Substitutions will only be considered for the reasons noted in Item B above, based upon the Contractor's representation that by submitting any Request for Substitution, the Contractor:

1. has researched the proposed substitution and has determined that it is equivalent to or superior in all respects to that specified.
2. confirms that the same warranties or bonds apply for the substitution as for the specified product, material, system and/or construction method.
3. has determined by its best judgment and experience that the proposed substitution is either necessary or in the County's best interest.
4. will coordinate the installation of any accepted substitution into the Work, and will make such changes as may be required for the Work to be complete in all respects.
5. waives claims for additional costs caused by the substitution which may subsequently become apparent.
6. has submitted complete cost data which includes all related costs under its Contract.

D. Disqualifications: No consideration will be given to proposed substitutions when:

1. the procedures described herein have not been followed
1. they are indicated or implied on shop drawing submittals without having been formally requested in accord with provisions specified herein.
2. for their implementation they require a major revision in the Work in order that their use may be accommodated.
3. they materially alter the design concept including color or function originally intended by the specified product.

## **6. SUBMITTAL PROCEDURES ON SUBSTITUTIONS**

- A. Substitution Request Form: The appropriate attached form must be filled out in its entirety and submitted in addition to the submittal information and data noted below. Submit a separate Substitution Request Form for each proposed substitution.
- B. Submittals: Submit three (3) copies of each Substitution Request Form and of each of the following related support items:
  1. Identify product for which substitution is proposed by description, brand name and catalog number, giving specification section number where specified.
  2. Identify in similar manner the proposed substitution and include the manufacturer's name, address and telephone number.

3. Itemize differences between product specified and proposed substitution, including but not limited to physical, color, function and guarantee considerations.
4. Itemize changes in adjacent work occasioned by proposed substitutions.
5. Accompany request with test data from independent laboratory substantiating quality and performance of proposed substitution.
6. Attach manufacturer's complete instructions on storage, handling and installation.
7. Provide list of three projects giving names, addresses and phone numbers of owners, general contractors, and architects where proposed product has been used.
8. State proposed change to the Contract Sum (for post-Contract Award substitutions) and proposed change to the Contract Time if substitution is accepted and confirmed by Change Order. If the proposed substitution involves a change to the Contract Sum, any change in cost of adjacent or related Work shall be included also.
9. State the number of days (not less than 15) during which the substitution as submitted is subjected to acceptance.
10. Include any cost savings to the County which might result from this substitution (for post-Contract Award substitutions).

## **7. ACCEPTANCE OR REJECTION**

- A. The Architect and/or the Construction Manager have the authority to reject any substitution submittals due to incompleteness or for other good reason.
- B. The Architect will be the sole judge of the acceptability of the proposed substitution.
- C. Only the Architect, with the County's approval, will have the authority to change the specified standards of quality. However, neither this authority to act under this provision, or any decision made in good faith either to exercise or not to exercise this authority, shall give rise to any duty or responsibility of the Architect to the Contractor, subcontractor of any tier, any or their agents or employees or other persons performing the Work or offering to perform the Work.
- D. The Construction Manager will attain a prompt review from the Architect of the Request for Substitution which complies with the above provisions.
- E. If no exceptions are taken, approval will be granted in writing. If the substitution represents a change to the Contract Documents, the substitution will be confirmed by Change Order.

- F. If accepted, the Contractor explicitly assumes all liability for the fit and function of all surrounding assemblies, and all interfacing devices.
- G. If rejected, the Contractor will be promptly notified, and the Contractor shall proceed with the Work in accordance with the Contract Documents.

**END OF SECTION 01 630, PRODUCTS & SUBSTITUTIONS**  
follows Substitution Request Forms

**SUBSTITUTION REQUEST FORM**  
A. *For Use During Bid Period*

*(For use by Architect)*  
 Accepted  
 Accepted as Noted  
 Not Accepted  
 Received Too Late

From: \_\_\_\_\_

To: Gardner Spencer Smith Tench & Hensley

Project: \_\_\_\_\_ ITB No. \_\_\_\_\_

We hereby submit for your consideration the following proposed substitution in lieu of the specified item for the above-named project:

**Proposed Substitution:**

Specified Item:

Reference Drawing No(s).

Reference Specification Section/Paragraph

1. Attach complete information and technical data on any changes to the program, drawings, specifications, or other Contract Documents which the proposed substitution will necessitate for its proper incorporation.
2. Accompany this request with all samples and substantiating data necessary to prove equal quality and performance levels of the proposed substitution to those of the specified item. Clearly mark manufacturer's literature to highlight the indicated equality in performance.
3. Respond to each of the following questions (use additional sheets if necessary):
  - A. What is the quality level of the proposed substitution versus that of the specified item?
  - B. What are significant variations between the proposed substitution and the specified item?
  - C. What affect(s) would the proposed substitution have on the operation and maintenance of the completed facility?

**SUBSTITUTION REQUEST FORM (continued)**  
*For Use During Bid Period*

D. Are manufacturer's warranties for the proposed substitution and the specified item the same?  
Yes \_\_\_\_ No \_\_\_\_

If no, explain:

E. What effect would the proposed substitution have on other trades?

F. How would the proposed substitution affect the project schedule?

H. What reason(s) supports this request?

The undersigned states and certifies that the function, appearance, and quality of the proposed substitution are equivalent or superior to those of the specified item and assumes the liability for the provision of equal performance of same as a minimum. THIS FORM MUST BE SIGNED.

SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

NAME (type or print): \_\_\_\_\_

COMPANY: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

\_\_\_\_\_

TELEPHONE: \_\_\_\_\_

NOTE: Signature shall be by a person having authority to legally bind his/her firm to the above terms. Failure to provide a legally binding signature will result in the retraction of any approval of this proposed substitution.

**SUBSTITUTION REQUEST FORM**

B. *For Use Only After Contract Award*

*(For use by Architect)*

- Accepted
- Accepted as Noted
- Not Accepted
- Received Too Late

From: \_\_\_\_\_

To: Gardner Spencer Smith Tench & Hensley

Project: \_\_\_\_\_ Contract No. \_\_\_\_\_

We hereby submit for your consideration the following proposed substitution in lieu of the specified item for the above-named project:

**Proposed Substitution:**

\_\_\_\_\_

\_\_\_\_\_

Specified Item:

\_\_\_\_\_

\_\_\_\_\_

Reference Drawing No(s).

Reference Specification Section/Paragraph

\_\_\_\_\_

\_\_\_\_\_

1. Attach complete information and technical data on any changes to the program, drawings, specifications, or other Contract Documents which the proposed substitution will necessitate for its proper incorporation.
2. Accompany this request with all samples and substantiating data necessary to prove equal quality and performance levels of the proposed substitution to those of the specified item. Clearly mark manufacturer's literature to highlight the indicated equality in performance.
3. Respond to each of the following questions (use additional sheets if necessary):

A. What is the quality level of the proposed substitution versus that of the specified item?

\_\_\_\_\_

B. What are significant variations between the proposed substitution and the specified item?

\_\_\_\_\_

C. What affect(s) would the proposed substitution have on the operation and maintenance of the completed facility?

\_\_\_\_\_

\_\_\_\_\_

**SUBSTITUTION REQUEST FORM (continued)**  
*For Use Only After Contract Award*

D. Are manufacturer's warranties for the proposed substitution and the specified item the same?  
Yes \_\_\_\_ No \_\_\_\_

If no, explain:

\_\_\_\_\_

\_\_\_\_\_

E. What effect would the proposed substitution have on other trades?

\_\_\_\_\_

\_\_\_\_\_

F. How would the proposed substitution affect the project schedule?

\_\_\_\_\_

\_\_\_\_\_

G. What are accurate comparative cost figures between the proposed substitution and the specified item?

\_\_\_\_\_

\_\_\_\_\_

H. What reason(s) justifies this request for a substitution?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

The undersigned states and certifies that the function, appearance, and quality of the proposed substitution are equivalent or superior to those of the specified item and assumes the liability for the provision of equal performance of same as a minimum. THIS FORM MUST BE SIGNED.

SIGNATURE: \_\_\_\_\_

DATE: \_\_\_\_\_

NAME (type or print): \_\_\_\_\_

COMPANY: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

\_\_\_\_\_

TELEPHONE: \_\_\_\_\_

**NOTE:** Signature shall be by a person having authority to legally bind his/her firm to the above terms. Failure to provide a legally binding signature will result in the retraction of any approval of this proposed substitution.

## SECTION 01 680 – EQUIPMENT & SYSTEMS INSTRUCTION

### 1. GENERAL

- A. Furnish all labor, materials, tools, equipment and services for the cleaning up or preparation of all equipment which is required in conjunction with the instruction work to be performed for County personnel.
- B. Coordinate additional instruction of County's personnel for any and all items of work of all trades that are incomplete at the time initial instruction sessions are scheduled.
- C. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation, and provide instructions upon the functions of that installation.
- D. Provide instruction for all equipment and systems for which operating and maintenance data is required. See General Requirements Section 01 730 for individual details of the operations and maintenance data requirements.
- E. Instruction sessions may be combined to some extent between several pieces of similar equipment within the same training session, but only if that combination is defined in the Contractor's instruction program submittal and approved by the Construction Manager.
- F. One instruction session for each major type of equipment will be required. The Contractor shall anticipate that up to ten (10) County employees will participate in any particular instruction session, and shall be prepared to provide the required number of manuals and tools for each session.
- G. The Contractor shall complete all instruction sessions in an acceptable manner prior to its request to receive a Certificate of Substantial Completion.

### 2. QUALITY ASSURANCE

Instructors for all sessions shall be member(s) of the installers' staff and authorized representative(s) of component, assembly, or system manufacturer(s). Refer to individual sections of the Technical Specifications for additional detailed requirements necessary to provide adequate instruction for specific systems or pieces of equipment.

### 3. PRESENTATION OF SUBMITTALS

- A. No later than ninety (90) days prior to scheduled Substantial Completion of the Work, the Contractor shall submit a list of proposed instruction sessions for the entire Project. This list shall

be organized by Specification Section and its contents will be subject to the approval of the Construction Manager.

- B. After approval of the content of the required instruction program, submit course outlines for each of the approved instruction sessions. Outlines shall be organized by Specification Section, and their contents will also be subject to the approval of the County.
- C. After approval of the program content, the Contractor shall submit planned course schedules for each of the approved instruction sessions which are to be organized by Specification Section, and the scheduled dates will be subject to the approval of the Construction Manager and representatives of the County.
- D. All instruction courses will be planned and scheduled such that the County's participants will utilize copies of the Project Operations and Maintenance Manuals which will have been previously provided. These copies are in addition to the quantities which will have been provided to the County, through the Construction Manager, under General Requirements Section 01 730. The use of draft copies of these manuals will be acceptable only with the prior written approval of the Construction Manager.
- E. Submit a separate instruction request/report for each system or type of equipment, subject to the County's approval of availability of personnel.
  - 1. Submit request/report (form attached) with preliminary information indicated, to the Construction Manager at least two (2) weeks prior to first instruction period.
  - 2. After each instruction session, submit three (3) copies of the completed report to the Construction Manager.

#### **4. PREPARATION**

- A. Do not begin instructions until component, assembly or system has been tested as specified and is in satisfactory operating condition.
- B. Prior to instruction sessions, assemble instructional aids, tools, test equipment and any necessary copies of approved Operations and Maintenance Manuals. If the Operations and Maintenance Manuals have not been approved prior to this time, supply draft copies for use in the training courses.

#### **5. INSTRUCTION**

- A. Provide all instruction as required to ensure understanding of all operating and maintenance procedures by the County's designated personnel.

- B. Instruct County's personnel in operation and maintenance of equipment and systems. Provide all necessary instruction to satisfaction of County.
- C. Explain use of Operating and Maintenance Manuals.
- D. Tour building areas involved and identify:
  - 1. Maintenance points and access.
  - 2. Control locations and equipment.
- E. Explain operating sequences:
  - 1. Identify location and show operation of switches, valves, etc., used to start, stop and adjust systems.
  - 2. Explain use of flow diagrams, operating sequences, diagrams, etc.
  - 3. Demonstrate operation through complete cycle(s) and full range of operation in all modes, including testing and adjusting relevant to operation.
- F. Explain use of control equipment, including temperature settings, switch modes, available adjustments, reading of gauges, and functions that must be serviced only by authorized factory representative.
- G. Explain trouble shooting procedures:
  - 1. Demonstrate commonly occurring problems.
  - 2. Note procedures which must be performed by factory personnel.
- H. Explain maintenance procedures and requirements:
  - 1. Point out items requiring periodic maintenance.
  - 2. Demonstrate typical preventive maintenance procedures and recommend typical maintenance intervals.
  - 3. Demonstrate other commonly occurring maintenance procedures not part of preventive maintenance program.
  - 4. Identify maintenance materials to be used.

- I. Furnish all tools and/or test equipment required for proper instruction of the County's personnel. Tools and/or test equipment shall be distributed in "sets" with each two participants having a "set" to work with and retain upon completion of the instruction. Each participant shall sign for their tools at the start of the instruction session, and copies of the assignment documents shall be provided to the Construction Manager by the Contractor.
  
- J. Refer to commissioning requirements specified in Section 17 200

**END OF SECTION 01 680, EQUIPMENT & SYSTEMS INSTRUCTION**  
follows Equipment and Systems Instruction Report (one page) attached

EQUIPMENT AND SYSTEMS INSTRUCTION REPORT

PROJECT: \_\_\_\_\_

SYSTEM OR EQUIPMENT: \_\_\_\_\_

CONTRACTOR NAME \_\_\_\_\_ CONTRACT NO. \_\_\_\_\_

SPECIFICATION SECTION

*NOTE: The Contractor's Representative must maintain and complete this report during instruction.*

PRELIMINARY INFORMATION

1. To be completed by the Contractor:
  - A. Proposed dates for instruction period: From \_\_\_\_\_ to \_\_\_\_\_
  - B. Name of Representative Instructor: \_\_\_\_\_
  - C. Approximate number of hours of training required: \_\_\_\_\_
2. To be completed by the County:
  - A. County's Designated Personnel to receive instruction: (Identify supervisor, if required).

1) _____	6) _____
2) _____	7) _____
3) _____	8) _____
4) _____	9) _____
5) _____	10) _____
  - B. Training Session Location: \_\_\_\_\_

RECORD INFORMATION

Instructor's Signature: \_\_\_\_\_ Date Instruction Completed: \_\_\_\_\_

Construction Manager's Signature: \_\_\_\_\_

County's Signature: \_\_\_\_\_

SPECIAL CONSIDERATIONS / NOTES:



## SECTION 01 700 – PROJECT CLOSEOUT

### 1. GENERAL REQUIREMENTS

- A. Comply with requirements for administrative procedures stated in this and other sections of the Project Manual in closing out the Work. Closeout procedures are summarized in this Section.
- B. Contract requirements shall be met when construction activities have successfully produced, in order, completion of these three closeout stages:
  - 1. Substantial Completion
  - 2. Final Completion
  - 3. Final Payment
- C. The Contractor shall provide all written notices and supporting documentation as described in Paragraphs 2 and 3 below when requesting Substantial Completion and Final Completion, respectively. Partial submittals of the required documents shall not represent a valid request, and the County, Architect, and Construction Manager shall not be liable for any delays in the Substantial and Final Completion dates arising there from.

### 2. SUBSTANTIAL COMPLETION

- A. Reference the *Owner-Contractor Agreement*, Article 9, regarding Substantial Completion.
- B. Prerequisite - the commissioning, described in Division 17 must be complete, except for functional testing and controls training, prior to Substantial Completion, unless approved in writing by the Owner's Project Manager.
- C. When the Work is substantially complete, the Contractor shall submit to the Construction Manager:
  - 1. a written notice that the Work, or designated portion thereof, is substantially complete.
  - 2. an original Certificate of Occupancy for the Project.
  - 3. a list of items to be completed or corrected (hereinafter referred to as a "Punch List").
  - 4. a request for a Substantial Completion inspection on a date acceptable to the Architect and the Construction Manager.

5. Project record documents, operation & maintenance manuals, warranties, and certificates for review and approval.
- D. Within a reasonable time after receipt of such notice, the Architect, the Construction Manager, the Contractor, and the County will make a joint inspection to determine the status of completion. County representatives for this inspection shall include, but not be limited to, the user department(s) and the Department of Personnel, Workers Compensation & Office Services Division. The Punch List submitted by the Contractor will be reviewed in detail during the inspection, with items added or deleted to indicate Work to be corrected or completed.
- E. After completion of the joint inspection described in Paragraph 2.C above, the Construction Manager will consolidate all Punch List comments and transmit them to the County Department of Public Buildings & Grounds (DPB&G). Within a reasonable amount of time after receipt of such consolidated Punch List, DPB&G shall conduct its own inspection, to include, but not be limited to, the installation and operation of all mechanical, electrical, plumbing, and other building systems. The consolidated Punch List will be reviewed in detail during the inspection, with items added or deleted to indicate Work to be corrected or completed.
- F. The County, the Architect, and/or the Construction Manager reserve the right to issue a revised Punch List based on the inspections described in 2.C and 2.D above. The Construction Manager will reproduce and distribute copies of any revised Punch List to the Contractor and see that the items requiring correction or completion are given prompt attention by the Contractor. Depending on the number and type of items on the Punch List, the Construction Manager may withhold the issuance of the Certificate of Substantial Completion until corrections required by said Punch List are made or all parties are satisfied that they will be made.
- G. Should the Architect and/or the Construction Manager determine that the Work is not substantially complete:
  1. The Construction Manager will promptly notify the Contractor in writing, on behalf of the Architect, giving the reasons therefore.
  2. The Contractor shall remedy the deficiencies in the Work, and then send a second written notice of Substantial Completion to the Construction Manager.
- H. Paragraphs 2.B through 2.D will be repeated.
- I. Should it become necessary to perform more than one (1) reinspection due to the inaccurate claims of the status of completion made by the Contractor, the Construction Manager may deduct the costs of such reinspections from the final payment, including but not limited to costs incurred by the Construction Manager and the Architect, and costs incurred by the Owner for payment of compensation to the Construction Manager and the Architect, for services performed for the reinspection(s). Also refer to General Requirements Section 01 400, *Quality Control*.

- J. When the Architect and the Construction Manager concur that the Work is substantially complete, the Construction Manager will:
1. Prepare a Certificate of Substantial Completion accompanied by the Contractor's Punch List of items to be completed or corrected, as verified and amended by the Architect, the Construction Manager, and the County.
    - a. Contract responsibilities are not altered by inclusion or omission of required Work for the Punch List.
    - b. The Construction Manager will coordinate with both the County and the Contractor to establish each parties' responsibilities with respect to security, maintenance, heat, utilities, damage to the Work, and insurance, all of which shall be clearly delineated on the Certificate of Substantial Completion.
  2. Sign the Certificate of Substantial Completion and submit it to the County, the Architect, and the Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.

### 3. FINAL COMPLETION

- A. Reference the *Owner-Contractor Agreement*, Article 9, regarding Final Completion.
- B. Prerequisites –
1. All TAB work and the commissioning of Division 17 must be complete prior to Final Completion, unless approved in writing by the Owner's Project Manager. Exceptions to this are the planned control system training performed after occupancy and any required seasonal or approved deferred testing. This includes for all systems, but is not limited to:
    - a. Completed and signed start-up and prefunctional checklist documentation
    - b. Requested trend log data
    - c. Submission of final approved TAB report
    - d. Completion of all functional testing
    - e. Required training of Owner personnel completed and approved
    - f. Submission of the approved O&M manuals
    - g. All identified deficiencies have been corrected or are approved by the Owner to be exceptions from this milestone
  2. The Owner's Project Manager will determine the date of Final Completion after reviewing the Commissioning Agent's recommendation.
  3. Commissioning activities are non-compensable and cannot be a cause for delay claims.

- C. To attain Final Completion, the Contractor shall complete the activities pertaining to Substantial Completion Certificate and complete work on all Punch List items. Only then shall a written request to the Construction Manager for final inspection be submitted.
- D. When the Work is complete, the Contractor shall submit to the Construction Manager written certification that:
  - 1. the Contract Documents have been complied with in their entirety.
  - 2. the Work has been inspected for compliance with Contract Documents.
  - 3. the Work has been completed in accordance with Contract Documents.
  - 4. the Work is completed and ready for final inspection.
- E. The Construction Manager, Architect, Contractor and County will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.
- F. Should the Architect and/or Construction Manager determine that the Work is incomplete or defective:
  - 1. The Construction Manager will promptly notify the Contractor in writing, listing the incomplete or defective Work.
  - 2. The Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to the Construction Manager that the Work is complete.
- G. Paragraphs 3.B through 3.D will be repeated.
- H. Should it become necessary to perform more than one (1) reinspection due to failure of the Work to comply with the claims of status of completion made by the Contractor, the Construction Manager may deduct the costs of such reinspections from the final payment, including but not limited to costs incurred by the Construction Manager and the Architect, and costs incurred by the Owner for payment of compensation to the Construction Manager and the Architect, for services performed for the reinspection(s). Also refer to General Requirements Section 01 400, *Quality Control*.
- I. When the Architect and the Construction Manager find that the Work is acceptable under the Contract Documents, the Contractor will be requested to make a final closeout submittal.

#### **4. CONTRACTOR'S CLOSEOUT SUBMITTALS**

The Contractor shall provide to the Construction Manager the following documents in the quantity of one original and one copy unless otherwise noted. Note that with the exception of Subparagraphs 4.G, 4.H, 4.J, and 4.K below, submittal for approval shall have already been made prior to Substantial

Completion. Submittal under this Paragraph would be for a final submittal should revisions or additional copies be required of previously submitted documentation.

- A. Evidence of Compliance with all requirements of governing authorities:
  - 1. Certificate(s) of Occupancy
  - 2. Certificates of Inspection, for Mechanical, Electrical, Plumbing, Fire Protection, and others as may be required.
- B. Project Record Documents: Refer to Section 01 720 of the General Requirements.
- C. Operation & Maintenance Manuals: Refer to Section 01 730 of the General Requirements.
- D. Subcontractor List: A complete listing of all subcontractors and their suppliers, indicating business addresses, telephone numbers, contact names, and items supplied by each.
- E. Manufacturer List: A listing of manufacturers of major materials, equipment and systems installed in the Work, and local contact addresses and phone numbers.
- F. Warranties: Refer to Section 01 740 of the General Requirements, and individual sections of the Technical Specifications.
- G. Payment of Debts and Claims and Consent of Surety: The Contractor shall submit adequate evidence that the Contractor has paid all obligations to date arising out of the Contract using AIA Document G706. Contractor shall also submit AIA Document G707, indicating written consent of its Surety to final payment.
- H. Release of Claims and Liens: The Contractor and each subcontractor shall also submit AIA Document G706A, indicating that the releases for waivers submitted are complete to the best of its knowledge and information.
- I. Final Approvals and Certificates:
  - 1. Plans and Certificates approved by the Fulton County Development Services Department which were maintained at the jobsite shall be amended to show construction changes and resubmitted as required by law.
  - 2. Contractors requiring filing shall complete all Fulton County inspections and permits records before Application for Final Payment. Submit all approvals and certificates required by the Specifications, Drawings and applicable codes and regulations of all relevant departments or agencies of Fulton County, State of Georgia, and local authority having jurisdiction.

- J. Shop Drawings, Manufacturer's Literature and Test Data (one copy only): The Contractor shall submit through the Construction Manager to the County, before final acceptance, all reviewed shop drawings (with all corrections noted), plus sets of all approved catalog cuts, equipment manuals, etc. All materials shall be indexed by Specification section. This submittal shall include a list of each room and its paint manufacturers and/or wall covering number for the County's use.
- K. Keys and Maintenance Materials: All keys, maintenance kits or stock, replacement parts or materials, spare construction materials, and equipment required under the Contract Documents shall be delivered or made available to the County. Also refer to Section 01 760 of the General Requirements.
- L. No partial submittals of the above items are to be made to the Construction Manager. All items of each category are to be collected by the Contractor and delivered at one time to the Construction Manager, together with a letter of transmittal listing all items. Where items are to be delivered to the County's representative, the Contractor shall include a copy of the transmittal letter listing all enclosures, signed by the County's representative acknowledging receipt.

**END OF SECTION 01 700, PROJECT CLOSEOUT**

## SECTION 01 710 – FINAL CLEANING

### 1. RELATED WORK SPECIFIED ELSEWHERE

- A. Periodic clean-up during construction - See General Requirements Section 01 500 for additional details of these requirements.
- B. Refer to appropriate sections of the Technical Specifications for special cleaning instructions for specific work. Lacking such specific instructions, provide final cleaning on all delivered materials and equipment as specified herein.

### 2. PRODUCTS

- A. The Contractor is to use only cleaning materials as recommended by manufacturer of surface to be cleaned.
- B. The Contractor is to use cleaning materials only on surfaces as recommended by the manufacturer of the cleaning material.

### 3. EXECUTION

- A. At the completion of the Work, the Contractor will remove all trash and debris and clean all surfaces associated with his work, and leave the project ready for occupancy by the County.
- B. Experienced workmen or professional cleaners only are to be employed for final cleaning.
- C. Paved surfaces are to be broom clean. Other porous surfaces are to be raked clean. All stone and non-porous surfaces shall be wiped clean.
- D. All surfaces shall have all stains removed.
- E. Electrical work, including lighting fixtures, is to be thoroughly cleaned.
- F. Prior to acceptance of any area of the project by the County, the Contractor is to notify the Construction Manager as each area becomes ready for inspection. The final clean-up will be inspected by the Construction Manager with the Architect and the County as required.
- G. The Construction Manager will notify the Contractor in writing if any clean-up is unacceptable. If the Contractor fails to comply after receiving written notice from the Construction Manager, the Construction Manager will perform whatever corrective action is necessary, with the resultant costs to be borne by the Contractor.

- H. The Contractor will maintain cleaning services until the Project or portion thereof is accepted by County.

**END OF SECTION 01 710, FINAL CLEANING**

## SECTION 01 720 – PROJECT RECORD DOCUMENTS

### 1. GENERAL

- A. Definition: Record Documents are defined to include those documents or copies relating directly to performance of the Work. Record Documents show changes in Work in relation to way in which Work was shown and specified by the original Contract Documents, and show additional information of value to County's records, but not indicated by the original Contract Documents. Record Documents include marked-up copies of Construction Drawings, Specifications, Field Orders and Change Orders, reviewed copies of Shop Drawings, Product Data and Samples, a final product list, test records, field records for variable and concealed conditions such as excavations and foundations, and miscellaneous record information on Work which is otherwise recorded only schematically or not at all. Certain portions of the Contract Documents may indicate specific Record Document requirements which extend the requirements of this Section.
- B. Throughout progress of the Work, maintain and continually update an accurate record of changes in the Contract Documents.
- C. Provide access to all Record Documents for the County's, Architect's, and Construction Manager's reference and review throughout the progress of the Work.
- D. As a condition of Substantial Completion of the Work, the Contractor shall deliver Record Documents to the Construction Manager as provided below.

### 2. MAINTENANCE OF DOCUMENTS

- A. One copy of current Record Documents shall be maintained at the Contractor's jobsite office at all times.
- B. Delegate responsibility for maintenance of Record Documents to one person.
- C. Provide files and racks for suitable storage of documents, and file all documents and samples in a neat and orderly manner.
- D. Protect Record Documents from loss in a secure location. Maintain documents in a clean, dry, legible condition, and in good order. Record Documents are not to be used for construction purposes.

### 3. RECORDING OF CHANGES AND OTHER PERTINENT INFORMATION

- A. Record all changes and other pertinent information concurrently with construction progress.
- B. Accuracy of Records: Coordinate changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other documents where such entry is required to show change. The accuracy of records shall be such that future searches for maintenance or analysis purposes may reasonably rely on information obtained from the Record Documents.
- C. Do not permanently conceal any of the Work until changes or other pertinent information has been recorded on the appropriate Record Documents with dimensions from a permanent reference point.
- D. Drawings:
  - 1. Mark the drawing that is most capable of showing actual physical condition, fully and accurately.
  - 2. Where Shop Drawings are marked up, mark cross reference on Contract Drawings at corresponding location.
  - 3. Mark with erasable colored pencil, using separate colors where feasible to distinguish between changes for different categories of Work at same general location.
  - 4. Mark the location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
  - 5. Indicate all changes of dimension and detail, whether a field change or a directed change. Note Change Order number, Request for Information number, and/or similar identification associated with the initiation of each specific change.
  - 6. Provide Contractor's construction details which may not have been shown on the original Contract Documents.
- E. Specifications:
  - 1. Legibly mark each Section of the Technical Specifications with the manufacturer, trade name, catalog number, serial number and supplier of each product and item of equipment actually installed in the construction.
  - 2. Indicate all field changes and directed changes. Note Change Order number, Request for Information number, and/or similar identification associated with the initiation of each specific change.

- F. Shop Drawings, Product Data and Samples: Maintain as Record Documents. Legibly annotate any changes made after review(s).
- G. Label each Record Document "Project Record" in neat, large letters. This label shall appear in the same location on every record drawing.

#### 4. SUBMITTAL OF RECORD DOCUMENTS

- A. With its request for Substantial Completion of the Work, the Contractor shall furnish one marked-up print set of all Record Drawings and Specifications for review by the Construction Manager.
- B. Submittals will be reviewed for adequacy only and returned with comments, if any, to the Contractor.
- C. The Contractor shall incorporate all review comments into the Record Documents.
- D. After incorporation of review comments in the Record Documents, the Contractor shall submit the following as a final submittal:
  - 1. Drawings: one (1) mylar reproducible set (full-size, reverse reading, 3 mil thick) and three print sets of final marked-up drawings.
  - 2. Specifications: two (2) sets of final marked-up specifications.
  - 3. Shop Drawings, Product Data and Samples: one (1) copy each, except those related to the irrigation system, which shall be two (2) copies.
  - 4. Test records, executed Change Orders, field orders, requests for information, supplemental instructions, and other pertinent documentation: two (2) copies each.
- E. The final submittal shall include a transmittal letter containing the date, Project name and number, Contractor's name and address, title and number of each Record Document, certification that each document as submitted is complete and accurate, and the signature of the Contractor or of its authorized representative.
- F. All revisions to and final submittal of Record Documents shall be completed to the acceptance of the Construction Manager and the County prior to Final Completion of the Work and final payment.

### **END OF SECTION 01 720, PROJECT RECORD DOCUMENTS**



## SECTION 01 730 – OPERATING & MAINTENANCE DATA

### 1. GENERAL REQUIREMENTS

- A. Refer to individual sections of the Technical Specifications for specific requirements for instructions, maintenance manuals, and operating data, to be submitted by the Contractor in order to provide the County with all necessary documentation to adequately maintain and service materials, systems and equipment for the Project.
- B. The Contractor shall compile all such specified instructions, maintenance manuals and operating data as specified under the appropriate Technical Specification sections, and submit as described below in comprehensive sets of Operation and Maintenance Manuals.
- C. Coordinate the compiling and submittal of Operation and Maintenance Manuals with instructions to the County for equipment and systems, as described in General Requirements Section 01 680, *Equipment & Systems Instruction*. All complete Operation and Maintenance Manuals shall be submitted prior to the Contractor's request to receive a Certificate of Substantial Completion.

### 2. SUBMITTAL REQUIREMENTS

- A. Develop a sequential program for the development of the Operation and Maintenance Manuals. This program shall provide a step-by-step review of the development of the manuals. The following is an abbreviation of the required sequence of development of the manuals.
  - 1. Submittal of the Table of Contents
  - 2. Submittal of draft sections for County's, Architect's and Construction Manager's review
  - 3. Submittal of list of proposed attachments and appendices
  - 4. Submittal of initial draft of complete manual
  - 5. Submittal of final copies of all manuals with approved contents
- B. After all approvals have been obtained, submit to the Construction Manager four (4) sets of bound, clear and complete instructions for maintenance of materials, finishes, machinery and other items to ensure proper care and reasonable life expectancy thereof.
- C. Print or type, in orderly sequence, the required information for each item:
  - 1. Data shall include recommendations for inspection procedures, frequency of maintenance in cleaning, lubricating, type of lubricant, replacement items such as filters, product source locations, and servicing agencies and their phone numbers and additional data, if any, as specified in more detail elsewhere in the specifications.

2. Include data for all finishes, whether painted, coated, fabric, polished and satin finish metals, glass, natural finishes on wood, natural stone, manufactured stone and various masonry finishes to the extent that such finishes occur on the project.
  3. For machinery, provide maintenance manuals and include complete parts lists showing the source(s) of genuine replacement parts (with current list prices indicated for same if requested by the County).
- D. Bind each set of data in a manageable number of 8 ½" by 11" sturdy three-ring binders, indexed and clearly labeled by Specification Section and item description. Each set shall be indexed and tabbed for the completed manual regardless of its completeness at the time of its submittal.

Additional data will be added behind its tabbed location as received by the Construction Manager. Include an index for the completed set in each binder. Mark identification on both front and spine of each binder.

- E. Where the complexity of machinery is such that regular maintenance by a specialty service company is normal, or may be required by law, give notice thereof to the County in writing.

**END OF SECTION 01 730, OPERATING & MAINTENANCE DATA**

## SECTION 01 740 – WARRANTIES

### 1. GENERAL

- A. Unless additional maintenance or performance warranties are required, all the Work shall be warranted by the Contractor for one year after the date of Substantial Completion of the Contract.
- B. Project warranties submitted by the Contractor do not reduce the County's warranty rights provided under State laws and regulations.
- C. Where products, materials, equipment, or systems are not properly performing or operating, the warranty shall not be considered in effect until corrective work is provided and the items are properly performing or operating.
- D. Warranties shall not include replaceable items such as light bulbs or cleaning materials, or damage by wear, vandalism or unusual climatic phenomenon, except water and air leaks caused by such phenomena.
- E. Warranties shall be signed by representatives that are expressly authorized to bind the Contractor to the warranties' terms and conditions. This requirement shall also apply to signatures on warranties of subcontractors, installers, manufacturers, and other entities engaged by the Contractor which are required by the Contract Documents.

### 2. DEFINITIONS

- A. Warranties on the Work are in several categories, including those of the Owner-Contractor Agreement, and including (but not necessarily limited to) the following specific categories related to individual units of Work specified in Division 2 through 17 of the Technical Specifications:
  - 1. Special Project Warranty (Guarantee): A warranty specifically written and signed by the Contractor for a defined portion of the Work; and, where required, countersigned by a subcontractor, installer, manufacturer and/or other entity engaged by the Contractor.
  - 2. Specified Product Warranty: A warranty which is required by the Contract Documents, to be provided for a manufactured product incorporated into the Work; regardless of whether the manufacturer has published a similar warranty without regard for specific incorporation of product into the Work, or has written and executed a special project warranty as a direct result of Contract Document requirements.

The Contractor shall issue four (4) copies of a special product warranty if required by the Technical Specifications. Examples of items which will require a special product warranty

include roofing, waterproofing, certain insulation, caulking, wood and automatic doors, carpet and certain equipment.

3. Coincidental Product Warranty: A warranty which is not specifically required by Contract Documents (other than as specified in this Section), but which is available on a product incorporated into the Work, by virtue of the fact that manufacturer of product has published a 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 the individual sections of the Technical Specifications for the determination of portions of the Work which are required to be specifically or individually warranted, and for the specific requirements and terms of those warranties (or guarantees).

### 3. SCOPE OF WARRANTIES

A. Scope: The Contractor shall submit to the Construction Manager for transmittal to the Architect, upon completion of all the Work under the Contract, its written warranty made out to the County and in a form satisfactory to the Architect and the County, warranting all of the Work under the Contract to be free from faulty materials and improper workmanship, and warranting the Work against injury in the proper and usual use thereof. Under the warranty, the Contractor shall replace Work as may be found by the County to be improper or imperfect and to make good all damage caused to other work or materials by the imperfection or removal and replacement of the imperfect Work.

B. Time Limit / Individual Warranties: A specific warranty of the Contractor may cover a longer period than that stated above where so stipulated in the Contract Documents. Warranties under service policies and warranties for individual pieces of equipment shall be assigned and delivered to County prior to the date of Final Acceptance, but said individual warranties shall in no way modify or shorten the one year overall warranty to be provided by the Contractor.

C. Extended Warranties: Certain extended warranties by the Contractor or subcontractors, or maintenance contracts which are longer than one year's duration, may be required by the Contract Documents. At the completion of the Work, all such warranties or maintenance contracts covering materials, workmanship, maintenance, or other items as specified, shall be forwarded in duplicate to the Architect through the Construction Manager, together with a letter addressed to the County giving a summary of each said warranty as follows:

1. Character of Work covered by warranty
2. Name of subcontractor furnishing warranty
3. Period of warranty
4. Conditions of warranty

- D. General Limitations: It is recognized that specific warranties are intended primarily to protect County against failure of the Work to perform as required, and against deficient, defective and faulty materials and workmanship, regardless of sources. Except as otherwise indicated, specific warranties do not cover failures in the Work which result from:
1. unusual and abnormal phenomena of the elements,
  2. the County's misuse, maltreatment or improper maintenance of the Work,
  3. vandalism after the time of Substantial Completion, or
  4. insurrection or acts of aggression, including war.
- E. Cost: Contractor warranties shall provide for the correction of work performed without additional charge. Any additional expense or damage resulting from imperfect work or the removal or replacement of imperfect work shall also be covered by said Contractor warranties.

#### 4. CONTRACTOR OBLIGATIONS

- A. Related Damages and Losses: The Contractor shall be responsible for the correction of warranted Work which has failed. The Contractor shall remove and replace other Work which has been damaged as a result of such failure, or which must be removed and replaced to provide access for correction of warranted Work.
1. 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 the Contractor) which occurs as a result of failure of warranted Work.
- B. Reinstatement of Warranty Period: Except as otherwise indicated, when Work covered by a special project warranty or product warranty has failed and has been corrected by replacement or restoration, reinstate warranty by written endorsement for a period of time equal to original warranty period of time, starting on date of acceptance of replaced or restored Work.
- C. Replacement Cost, Obligations: Except as otherwise indicated, costs of replacing or restoring failing warranted units or products is the Contractor's obligation, without regard for whether the County has already benefited from use through a portion of anticipated useful service lives.
- D. Contractor's Procurement Obligations: Do not purchase, subcontract for, or allow others to purchase or subcontract for materials or units of work for the Project where a special project warranty, specified product warranty, certification or similar commitment is required, until it has been determined that entities required to countersign such commitments are willing to do so.

- E. Rejection of Warranties: The County reserves the right, at the time of Substantial Completion or thereafter, to reject coincidental product warranties submitted by the Contractor, which in the opinion of the County tend to detract from or confuse interpretation of the requirements of the Contract Documents.

**5. TRANSFER OF WARRANTIES TO OWNER**

- A. Format: The warranties shall cover all the Work done under this Contract. All Contractor warranties shall bear the endorsement of the Construction Manager in writing, as per the attached format on the following page:

**FORMAT FOR THE TRANSFER OF WARRANTIES TO OWNER**

TO: Fulton County Board of Commissioners

c/o: Fulton County Construction Manager

Re: (Work Covered in Warranty)

Project: \_\_\_\_\_

Name of Contractor: \_\_\_\_\_

Address of Contractor: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Dear County's Representative,

The undersigned warrants to the County that he will be responsible for all faulty or defective materials, equipment and workmanship, in the Work or portion thereof as referenced above, and that he will remedy any defects due thereto and pay for all damage to other work resulting thereof which shall appear within a period of \_\_\_\_\_ ( ) year(s) from the date of Substantial Completion, as defined in the Contract Documents.

*(Add additional conditions of warranty as noted in various technical sections of the Specifications.)*

During the warranty period, upon written notice from County, the undersigned shall proceed with due diligence at the undersigned's sole expense to remove and replace properly any defective materials and equipment or perform any labor necessary to correct any such defect in the above. In case that the undersigned fails to remedy such defects, then the County may furnish such materials and equipment or labor as are necessary to correct the work, and the undersigned agrees to reimburse the County for any expense therefore promptly and fully.

Signed: \_\_\_\_\_ \*\* Date: \_\_\_\_\_

Type/Print Name: \_\_\_\_\_

Witness: \_\_\_\_\_ \*\*

Construction Manager endorsement of the above-noted warranty:

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

*\*\* Signatures must be notarized.*

END OF SECTION 01 740, WARRANTIES

**SECTION 01750**

**BUILDING COMMISSIONING REQUIREMENTS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES:

- A. Roles and Responsibilities
- B. Included Systems
- C. Commissioning Team
- D. Submittals
- E. O&M Manuals
- F. Record Drawings
- G. Equipment Checklists
- H. Site Observation and Verification
- I. Functional Performance Testing
- J. Training

1.02 ABBREVIATIONS

- A. A/E: Architect/Engineer
- B. CxA: Commissioning Authority
- C. GC: General Contractor
- D. O&M: Operations and Maintenance
- E. TAB: Test, Adjust and Balance

1.03 SUMMARY

- A. Commissioning is a quality-focused process for enhancing the delivery of a project. The process focuses on verifying and documenting that the facility and all its systems and assemblies are planned, designed, installed, tested, operated and maintained to meet the Owner's Project Requirements (OPR).
- B. The purpose of Commissioning is to provide a systematic process of assuring by verification and documentation, from the design phase to a minimum of one year after construction, that all facility systems perform interactively in accordance with the design documentation and intent and in accordance with the owner's operational needs.

1.04 ROLES AND RESPONSIBILITIES

A. General Contractor

1. The responsibility for the construction quality rests with the GC.
2. The CxA has no authority to change the contract or direct the GC in any of their work, only to provide comments and suggestions. Issues that cannot be solved between the GC and the CxA will be jointly presented to the Owner for resolution.
3. Pursuant to each CxA field comment, the GC will consider the comment and provide a formal response. Responses shall be returned to the CxA in a timely fashion, for proper feedback and to facilitate subsequent review and resolution.
4. The CxA activities will be keyed to the construction activities, therefore, it is essential that the construction scheduling be actively communicated to the CxA. The GC shall be responsible for communicating to the CxA the construction schedules, milestones, completion schedules, planned testing, etc., including updates, in the same fashion, timeliness and level of detail as is provided to the Owner. The CxA may not attend every construction meeting, and so relying on the dissemination of this information entirely as part of the normal construction meetings is not acceptable.
5. The GC shall be responsible to make sure that accurate record drawings are maintained by each trade at the job site throughout the construction phase. The record drawings shall be available for review and use by the CxA at any time during normal business hours. If discrepancies are noted on the record drawings, these shall be corrected promptly to maintain the accuracy of the record drawings throughout the project.
6. The GC shall be responsible to ensure that each subcontractor cooperates and provides information, assistance, and responses to the CxA as described, and within the time frame described.
7. Warranty
  - a. The GC shall provide a summary of all warranty items. The items shall be delineated by specification section number, title, and description.
  - b. For each warranted item, include the date when the warranty is to begin, the duration of the warranty, and Owner's obligations to maintain the warranty.

B. Division 15 Contractor

1. The Contractor shall be responsible for the following:
  - a. Provide submittal data, commissioning documentation, O&M data and training required by this Commissioning Specification, including information from equipment suppliers
  - b. Attend meetings necessary to facilitate the Commissioning process.
  - c. Complete construction checklists provided by the CxA and return completed forms to the CxA.
  - d. Provide to CxA all requested submittal data and O&M data as described in Part 3 of this section and where specified elsewhere in the Contract Documents.
  - e. Address current A/E punch list items before functional performance testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional performance testing of the respective air or water related systems.
  - f. Assist and cooperate with the CxA. Provide skilled technicians familiar with this building to assist execute the functional performance testing of the control system and to perform functional testing

of equipment.

- g. Correct deficiencies as interpreted by the CxA, Owner, and A/E and retest the affected equipment.
- h. Provide training of the Owner's operating staff as described in Part 3 of this section and where specified elsewhere in the Contract Documents.
- i. Warranty Period
  - (1) Execute seasonal or deferred functional performance testing, witnessed by the CxA.
  - (2) Correct deficiencies and make necessary adjustments to O&M manuals and record drawings for applicable issues identified in any seasonal testing.

**C. Controls Contractor**

- 1. The Contractor will be responsible for the following:
  - a. Provide submittal data, commissioning documentation, O&M data and training required by this Commissioning Specification, including information from equipment suppliers
  - b. Attend meetings necessary to facilitate the Commissioning process.
  - c. Complete construction checklists provided by the CxA and return completed forms to the CxA.
  - d. Provide to CxA all requested submittal data and O&M data as described in Part 3 of this section and where specified elsewhere in the Contract Documents.
  - e. Assist and cooperate with the CxA. Provide skilled technicians familiar with this building to execute the functional performance testing of the control system, and perform functional testing of equipment as described in Part 3 of this section.
  - f. Correct deficiencies as interpreted by the CxA, Owner, and A/E and retest the affected equipment.
  - g. Provide training of the Owner's operating staff as described in Part 3 of this section and where specified elsewhere in the Contract Documents.
  - h. Warranty Period
    - (1) Execute seasonal or deferred functional performance testing, witnessed by the CxA.
    - (2) Correct deficiencies and make necessary adjustments to record drawings for applicable issues identified in any seasonal testing.

**D. Testing, Balancing, and Adjusting (TAB) Contractor**

- 1. The Contractor will be responsible for the following:
  - a. Assist and cooperate with the CxA as described in Part 3 of this section.
  - b. Perform TAB work as described in Part 3 of this section and as specified elsewhere in the Contract Documents.

- c. Warranty Period
  - (1) Execute seasonal or deferred functional performance testing, witnessed by the CxA.
  - (2) Correct deficiencies and make necessary adjustments.

E. Division 16 Contractor

- 1. The Contractor will be responsible for the following:
  - a. Provide submittal data, commissioning documentation, O&M data and training required by this Commissioning Specification, including information from equipment suppliers
  - b. Attend meetings necessary to facilitate the Commissioning process.
  - c. Complete construction checklists provided by the CxA and return completed forms to the CxA.
  - d. Provide to CxA all requested submittal data and O&M data as described in Part 3 of this section and where specified elsewhere in the Contract Documents..
  - e. Address current A/E punch list items before functional performance testing.
  - f. Assist and cooperate with the CxA. Provide skilled technicians familiar with this building perform functional performance testing of equipment.
  - g. Correct deficiencies as interpreted by the CxA, Owner, and A/E and retest the affected equipment.
  - h. Provide training of the Owner's operating staff as described in Part 3 of this section and where specified elsewhere in the Contract Documents.
  - i. Warranty Period
    - (1) Correct deficiencies and make necessary adjustments to O&M manuals and record drawings for applicable issues identified in any seasonal testing.
    - (2) Correct deficiencies and make necessary adjustments.

1.05 SAMPLING

- A. For some equipment it may be necessary to test a representative sample (i.e. testing 10% of 200 terminal units). In this case, the equipment to be tested will be randomly selected. If the sample of equipment is installed and working correctly, the remaining equipment will be presumed acceptable.
- B. When using this method of verification, the CxA will ensure that different equipment is inspected for each phase of commissioning. For example if 10% of terminal units are checked for proper installation on one visit, a different 10% of terminal units will be checked for proper operation.
- C. If reoccurring deficiencies are found when testing selected equipment, the Owner shall be informed. The Contractor shall inspect 100% of the equipment and shall correct any deficiencies.

1.06 PROBLEM SOLVING

- A. The CxA may recommend solutions to problems found. However the burden of responsibility to solve, correct and retest problems rests with the Contractor and the A/E.

1.07 COMMUNICATION DURING CONSTRUCTION PHASE

- A. Formal reports including Site Observation Reports will be distributed to the Owner, A/E and GC.
- B. Informal comments and observations from the Commissioning work will be relayed directly to the responsible party whenever possible. This includes field observations and functional performance test results. The direct communication approach will avoid delays from traditional remote paper exchanges, will encourage dialogue and discussion of options and alternatives, and generally maintain an atmosphere of cooperation and quality.
- C. Response Times
  - 1. Timeliness in delivering information or providing responses to the CxA are essential to providing the construction product to the Owner on time, as well as facilitating the commissioning process. The following are guidelines established to meet this objective.
    - a. Delivery of O&M manuals to CxA: Ninety (90) days after approved submittals
    - b. Delivery of Final Record Drawings to CxA: Two (2) weeks prior to Owner training
    - c. Delivery of Training Material to CxA: Sixty (60) days prior to the scheduled training
    - d. Deliver TAB test plan to CxA: Sixty (60) days after contract award
    - e. Response to a Cx field comment by a Contractor: Two (2) weeks or less from receipt of comment
    - f. Delivery of functional performance testing procedures by CxA to GC: One (1) month prior to testing
    - g. Time to correct discrepancies noted in Record Drawings during construction phase: Two (2) weeks from the date the discrepancy was noted

1.08 WARRANTY REVIEW

- A. Prior to the end of the GC's guarantee period, the CxA will review operational issues reported by the maintenance personnel to help determine if the operational problems have construction defects as their root cause.

1.09 INCLUDED SYSTEMS

- A. The following systems and their components are included in the scope of the Commissioning activities.
  - 1. Division 15 (Mechanical)
    - a. HVAC System
      - (1) Air handling units, including terminal devices
      - (2) Air cooled Chiller
      - (3) Pumps
      - (4) Fans
      - (5) Fan Coil Units

- (6) Piping and accessories
- (7) Ductwork and accessories
- (8) HVAC control systems
- b. Fire Protection
- c. Automatic Temperature Controls
- 2. Division 16 (Electrical)
  - a. Electrical components (disconnects, switchgear, motor control centers etc.)
  - b. Lighting Controls
  - c. Fire Alarm

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION**

**3.01 COMMISSIONING TEAM**

- A. Each Contractor shall designate a single individual to be responsible for coordinating commissioning activities with the CxA. This requirement is intended to facilitate effective communication during the commissioning process.
- B. The commissioning team consists of the Owner, Commissioning Authority (CxA), General Contractor (GC), Architect, Design Engineers, Mechanical Contractor, Electrical Contractor, the Test Adjust and Balance Contractor (TAB), Controls Contractor, Fire Protection Contractor, and Fire Alarm Contractor.

**3.02 COMMISSIONING MEETINGS**

- A. Most commissioning issues will be handled during regularly scheduled project coordination meetings. If specific topics require additional discussion, the commissioning team will meet immediately after the project coordination meeting.

**3.03 SUBMITTALS**

- A. Comply with the Division 1 requirements for submittals, but not less than the following:
  - 1. Manufacturers' detailed installation requirements
  - 2. Manufacturers' detailed start-up requirements
  - 3. Operation instructions
  - 4. Manufacturers' recommended maintenance and troubleshooting procedures
  - 5. Warranty and Owner's obligations to maintain warranty
  - 6. Detailed product data for each piece of equipment including capacities, electrical components and requirements, start-up procedures, etc.

7. Manufacturer's certified equipment test reports, where applicable
8. Full and part load performance curves for each chiller, pump and fan submitted over the expected operated ranges
9. Additional items applicable to Control System submittals:
  - a. Control System Architecture drawing
    - (1) Provide system communication drawing. All controllers, gateways, hubs, devices and communication cabling shall be accurately shown, except that individual sensor I/O wiring and devices need not be shown.
  - b. Control System Diagrams
    - (1) Provide schematic diagrams for each controlled system. Illustrate the relationship between control system and controlled equipment. Show all control elements. Show all terminations and cable/tube numbers.
    - (2) Provide equipment interface details using actual equipment termination information. Blank terminals or "field verify" is not acceptable.
    - (3) Provide individual diagrams for each mechanical system.
    - (4) The control diagrams and sequence of operation shall be together on the same sheet and shall be suitable for posting.
  - c. Sequence of Operation
    - (1) The sequence of operation shall reference a schematic diagram of the controlled system.
    - (2) The sequence of operation shall describe in words the control strategies utilized, worded in such a way to serve as an informative reference to the maintenance and service personnel who will be responsible for the unit operation
    - (3) Each component and instrument on the control diagram shall have a unique tag number. The sequence of operation shall make specific reference to the individual component tag number.
  - d. Control Logic Diagrams
    - (1) Submit detailed control logic diagrams. The intent is to have the control logic clearly defined and accepted prior to any programming to avoid rework and operational problems.

**B. Submittal Review**

1. The GC will forward a copy of each submittal to the CxA as described in Division 1. The CxA will review the submittals parallel to the A/E review. The focus of the CxA review will be to:
  - a. Verify that the equipment or system meets the Owner's Project Requirements.
  - b. Verify that equipment or system includes provisions for access and maintenance.
2. The Architect will receive the CxA comments and return a combined collective list of comments to the GC.

- a. Copies of the CxA comments will be provided to the Owner.
- b. A copy of the combined list of comments will also go to the CxA.

**3.04 O&M MANUALS**

**A. O&M manuals shall comply with the following requirements:**

1. The operation and maintenance manuals (O&M) manuals shall be submitted in electronic and paper format in accordance with the structure and content described in this specification. Contractors shall complete and submit three copies of each O&M manual section (section is defined as individual component package) within two months of the respective submittal acceptance. These will be reviewed by the CxA, the Owner's representative and the A/E.
2. The initial draft of the O&M manual must be available for review 90 days prior to the scheduled training. The final O&M manual must be available 60 days prior to the original substantial completion date. The GC shall compile the final O&M manual and submit 4 complete copies to the Owner's representative.
3. The O&M manuals shall cover the mechanical systems and components and the related electrical systems and components within the facility as defined by these specifications.
4. The final O&M manuals must be revised after the last changes to the systems and components to reflect these changes.
5. Final O&M manuals shall be submitted in a format that allows the Owner and his agents to modify, expand, add, eliminate, and/or edit any information, documentation or materials within the O&M manual as deemed necessary by these parties. This requirement shall include sufficient training and software for the Owner's agent necessary to train and equip the designated persons for this task.
6. The electronic O&M manual version submitted must allow users to print the entire manual or any portion thereof on standard 8-1/2" x 11", 8-1/2" x 14" or 11" x 17" paper.
7. Acceptable electronic formats for O&M manuals include Word 98 or newer, WordPerfect Version 8.0 or newer, Adobe Acrobat 6.0 or newer, or a web-based format. Other formats may be acceptable, but must be pre-approved. Contractors are responsible for ensuring that users are equipped with appropriate software and/or viewers necessary for as-builts and shop drawings.
8. Documentation contained within the O&M manual must be annotated and edited to reflect only that information pertinent to the component or system it is to describe. Scanned information is acceptable, but also must meet these criteria.
9. O&M manual shall be fully searchable. This shall mean that users are able to search the entire contents of the manual using simple text search functions.
10. The O&M manuals shall be fully integrated and navigable, defined as the ability for users to review and locate information for a particular component via location of system connected to, or actual definition of a component. In addition, it also implies that the user may also be able to locate and link to all pertinent information for a component from a single source.
11. CxA Review and Approval: Prior to substantial completion, the CxA shall review the O&M manuals for compliance to this specification. The CxA will communicate deficiencies in the manual to the PM and A/E. Upon successful review of the corrections, the CxA shall recommend approval and acceptance of the O&M manual sections to the PM. This work does not supersede the A/E's review of the O&M manuals according to the A/E's contract.
12. O&M manuals shall consist of five divisions: general information, facility information, system

definitions, component information, and system troubleshooting procedures. The following sections define the structure, order and content of these divisions

- a. General Information: The general information division of the manual shall consist of the pages defined below.
  - (1) Title/Home Page: A title/home page shall be included with the O&M manual. This page shall act as the beginning point for the manual and will include the following information and links:
    - (a) General description of the manual and its contents. Including general guidance on the use and navigation of the manual.
    - (b) Links to all other general information pages.
    - (c) A list or link to a listing of all defined rooms.
    - (d) Listing and links to all systems defined within the manual.
    - (e) A list or link to a listing of all available components defined within the manual.
  - (2) Table of Contents: A table of Contents is required for the manual. This table of contents must list and link to all information contained within the manual, including all manufacturer provided documentation.
  - (3) Contact Listing: A listing of all manufacturers, suppliers, contractors, sub-contractors, architects, and engineers involved with the project. This listing shall be sorted alphabetically by company and include the following information for each contact:
    - (a) Company
    - (b) Contact Person
    - (c) Address
    - (d) Phone Number
    - (e) Fax Number
    - (f) Emergency Phone Number
    - (g) E-mail address (if available)
    - (h) Web Address (if available)
    - (i) Project role and responsibilities
    - (j) Equipment/components supplied (manufacturer and suppliers)
  - (4) Commissioning Record and Testing Data: This is a separate manual provided by the Commissioning Authority dedicated to the documentation of the commissioning process utilized for the project. This includes all certifications, plans, testing data, procedures, reports, etc.
- b. Facility Information: Facility information includes definition and breakdown of the facility into a logical organizational and informational structure. This division includes the following information

- (1) Facility Definition: The facility definition shall be the initial information or title page for this division. This page is to relay general information regarding this facility and provide the following links and information on the page:
    - (a) Facility Photograph: A photograph of the entire facility
    - (b) Facility Description: An overall description of the facility, including information such as the overall use, total square footage, etc.
    - (c) Systems List: A link to a listing of all systems encompassed or serving the facility. All items defined within this listing should be linked directly to the system defined.
    - (d) Component List: A link to listings of all components within the facility. All items defined within this listing should be linked directly to the component defined.
    - (e) Floor Plan Listing: A link to a listing of all floor plans defined within this facility. All items defined within this listing should be linked to the floor plan defined.
    - (f) Room List: A link to a listing of all rooms within the facility. All items defined within this listing should be linked directly to the room defined.
  - (2) Floor Plan Definition: The floor plan definition shall describe and link all information available for each floor within the facility. Each floor shall have a sheet defined which includes the following information and links:
    - (a) Floor Plan: A graphic depicting the overall layout of the floor, including all room numbers.
    - (b) Floor Description: An overall description of the floor, including information such as the overall use, total square footage, etc.
    - (c) Systems List: A list or link to a listing of all systems encompassed or serving the floor. All items defined within this listing should be linked directly to the system defined.
    - (d) Component List: A list or link to a listing of all components within the floor. All items defined within this listing should be linked directly to the component defined.
    - (e) Room List: A list or link to a listing of all rooms within the floor. All items defined within this listing should be linked directly to the room defined.
  - (3) Room Definition: The room definition shall describe and link all information available for each room within the facility. Each room shall have a sheet defined link which includes the following information:
    - (a) Room Description: An overall description of the floor, including information such as the overall use, total square footage, designed occupancy, time of use schedules, etc.
    - (b) Systems List: A list or link to a listing of all systems encompassed or serving the room. All items defined within this listing should be linked directly to the system defined.
    - (c) Component List: A list or link to a listing of all components within the room. All items defined within this listing should be linked directly to the component defined.
- c. System Definitions: System definitions include a description and graphical representation of the purpose and composition of all systems as detailed within the general provisions section of this

specification. For each of these systems listed one (Minimum include drawing numbers) sheet shall be developed contain the following information and links:

- (1) System Ladder Diagram: Each system sheet shall include an engineering ladder diagram that is representative of the system. This graphic shall show all components and respective tags that are contained within the system, all interfaces with other systems, all destination or service areas, and visualization of flow direction. Crossover of lines should be avoided if possible.
- (2) System Description: Each system sheet shall include a description of the system and its function within the facility. This description shall include general information on the normal operating conditions of the system at the time of final testing and balancing.
- (3) System Procedures: A set of links to documents containing detailed procedures including but no limited to start-up, shutdown, emergency, seasonal changeover, and manual operation.
- (4) Component List: A list or link to a listing of all components associated directly with system defined. This list should represent all items shown within the system ladder diagram, and all items defined within this listing should be linked directly to the component defined.
- (5) System Troubleshooting Procedures: Link to a documentation describing the troubleshooting procedures for evaluation of the system as a whole. This document is to be developed by the Contractor and is described further in a later section of this specification.
- (6) For the Control system ONLY, the following additional information shall be present:
  - (a) A list of links to control system-training materials.
  - (b) A list or link to a listing of all available control system record drawings, including all sequence of operations and logic diagrams for all components.
  - (c) A link to a full point list describing the following information for each room in tabular format:
    - i. Location: Building, floor, and room number.
    - ii. AHU Tag #
    - iii. Reference Drawing #
    - iv. Air terminal unit Tag #, Heating and/or cooling Tag#
    - v. Minimum/Maximum cfm
    - vi. Room set points and range.
  - (d) Link to a listing of all component and room set points and ranges.
  - (e) Link to copy of entire control software program.
  - (f) Link to control software interface.
  - (g) List or link to listing of documentation on all checkout tests and calibrations performed.

- d. Component Information: The component information shall consist of individual sheets defined for each component present within the facility. These sheets shall include the following information and links:
- (1) Title: The title shall clearly define the component type and tag of the component described by the sheet.
  - (2) General Information: the general information section shall clearly define the following information in a tabular format in the order defined below:
    - (a) Tag number
    - (b) Manufacturer
    - (c) Model
    - (d) Serial Number
    - (e) Location: Building, floor, and room number.
  - (3) Contractor's Information: A listing of contact information for all contractors responsible for the installation, wiring, and TAB of a component. This item may also be a link to the particular information.
  - (4) Component Photograph: Photograph of unit in final installed location and orientation.
  - (5) Performance Characteristics: A table containing design, submittal and installed performance characteristics of a component in similar structure and content as that defined by the record drawings schedules
  - (6) Safety Precautions: Link to a document containing personnel hazards and component safety precautions for components under all operating conditions.
  - (7) Operation Procedures: List or link of documents containing detailed procedures for start-up, shutdown, emergency operation. The items defined within this listing shall be directly linked to the document defined.
  - (8) Documentation: List or link to a listing of all available documentation for a component. The following is a list of documentation required for each component as available:
    - (a) Relevant Specification Section
    - (b) Submittal
    - (c) Engineering Guide
    - (d) Installation, Operation, and Maintenance Manuals.
    - (e) Parts List: the parts list shall be composed of documentation that conveys the following information:
      - i. Exploded component Diagram: Diagram that clearly shows and labels all parts of the component.
      - ii. Identification table of parts shown in illustration with following additional information in tabular format:

- i. Part Number
- ii. Manufacturer
- iii. Model
- iv. Serial Number
- v. Catalog Number
- vi. Vendor Information: Contact information for available vendor of a defined part. This information may be supplied as a link, and must contain the following information:
  - Company
  - Address
  - Phone Number
  - Fax Number
  - Email address (if available)
  - Web Address (if available)
- iii. Troubleshooting Procedures: Link to available manufacturer troubleshooting procedures.
- iv. Preventative Maintenance Procedures: The preventative maintenance procedures shall include both documentation from the manufacturer on required maintenance, and documentation developed by the Contractor that describes the following information:
  - i. Documentation in checklist form that describes the preventative maintenance requirement of a component according to recurrence of procedures (Daily, monthly, bi-annually, etc). This documentation will include all lubrication requirements and instructions. A separate document shall be developed for each level of recurrence.
  - ii. Each checklist shall include information and links to information on how to perform each task, the tools required, and safety precautions.
- v. Record Drawings: A link, or links, to all relevant record drawings.
- vi. Detail Diagrams and Shop Drawings
- vii. Performance Data, Ratings, and Curves: Documentation describing performance characteristics of a component at a minimum of five (5) part load conditions for all normal operating conditions.
- viii. Controls Documentation : A list or link to a listing of documentation containing information on the control logic diagrams, sequence of operation, control set points, and calibration test for a component. This list shall also include a calibration schedule defining the re-calibration requirement for a component, if applicable.
- ix. Testing and Balancing Documentation: Link to applicable section of TAB report for a component.
- x. Warranty Information: A set of links to the following warranty documentation shall be included:

- i. Copy of the warranty
- ii. Listing and explanation of the warranty terms and conditions.
- iii. Date of warranty expiration.
- x*i*. Training Documentation: A list or link to a listing of all training material available for a component. This shall include, but is not limited to the following information:
  - i. Copy of any and all training seminars conducted and taped.
  - ii. Copy of all associated training material distributed during the training seminar.
- x*ii*. Tool Requirements: A link to documentation defining the tools required by Owner personnel to to perform testing, calibration, operation, maintenance, and repair on a component.
- x*iii*. Systems List: A list or link to a listing of all systems the component is associated with. All items defined within this listing should be linked directly to the system defined.
- x*iv*. Finishes Maintenance Manual: The respective finished CMcs shall provide maintenance instructions for finished, including recommended cleaning methods and materials and special precautions identifying detrimental agents.

### 3.05 RECORD DRAWINGS

- A. Record drawings shall be kept up to date at all times.
- B. Record Drawings shall be delivered in a timely manner, prior to training.
- C. The record drawings maintained by the Contractor will be periodically reviewed and verified by the CxA. Discrepancies in the drawings will be documented. The Contractor shall verify the record drawings against the installed system for all similar problems.

### 3.06 EQUIPMENT CHECKLISTS

- A. The intent of the Equipment Checklists is to provide individual workers the key criteria for a successful installation.
- B. Equipment Checklists are developed for each individual piece of equipment or system to track and verify equipment from the time it is delivered through installation.
- C. Equipment checklists will be provided to the Contractor by the CxA.
- D. The checklists shall be completed by the individual actually completing the work. Any negative responses to the checklist shall be explained and documented at the end of the checklist. The CxA will review each checklist with the Contractor to ensure the checklist is fully understood.
- E. The completion of the checklist does not eliminate the Contractor's responsibility for meeting other requirements in the Contract Documents.
- F. The use of checklists is not intended to increase the work of the Contractors but to detect and eliminate delivery, installation and start-up problems.

- G. The following Equipment Checklists will be developed by the CxA and provided to the Contractor:
1. Equipment Verification Checklist
    - a. Includes specified and actual equipment specifications such as manufacturer, model number, serial number, electrical ratings, and capacities.
  2. Equipment Pre-Installation Checklist
    - a. Includes several yes/no or short answer questions to document the condition of equipment prior to installation, proper staging, and use of approved/submitted equipment.
  3. Equipment Physical Installation Checklist
    - a. Includes several yes/no or short answer questions to document that the equipment is installed, electrically wired, properly aligned and has working controls.

**3.07 SITE OBSERVATIONS AND VERIFICATIONS**

- A. The CxA site observation reports may include construction issues, access and maintenance issues, safety issues, or other issues. Each observation is intended to improve the project quality and achieve the Owner's Project Requirements.
- B. The CxA site observation reports are not "punch lists" in that they focus on systemic problems. Where an issue is identified, not all of the same components will have been verified by the CxA.

**3.08 TEST, ADJUST AND BALANCE VERIFICATION**

- A. The TAB Contractor shall submit a test plan to the CxA for review and acceptance. The test plan should include detailed information on how the work is to progress and be managed.
- B. The CxA will review and verify the TAB final report in conjunction with overall system operation. Any corrections will be accomplished by the TAB Contractor at no expense to the owner or CxA.
- C. The TAB Contractor shall provide the CxA with the technician who accomplished the TAB, along with the specific equipment used for the TAB, to verify and re-test up to 10% of the TAB final report.

**3.09 FUNCTIONAL PERFORMANCE TESTING**

- A. The systems in the building will be operated in all of their different modes of operation to verify the facility operates properly as a whole.
- B. Functional Performance Test Checklists (FPT)
  1. The Checklist will be provided to the GC and all subs by the CxA prior to testing for review.
  2. The FPT procedures will provide step by step instructions in a pass/fail format.
  3. Negative responses shall be recorded and explained on the checklist and recorded in the CxA's issue log.
- C. The CxA will administer the Functional Performance Test. Each Contractor will be responsible to put the system in various modes of operation, to correct minor problems found during the test and to perform the testing.
- D. If total time required to correct minor problems during testing is greater than fifteen (15) minutes the test will

be considered failed and must be repeated.

- E. If major problems are discovered during the test, the responsible Contractor will correct the problem, and the test shall be redone. If more than two functional performance tests are required, the responsible Contractor will be charged for the CxA's additional time and expenses.
  - 1. A major problem is any problem or group of problems that require more than fifteen minutes to correct.
- F. Any deficiency (major or minor) shall be recorded on the Functional Performance Checklist and reported to the Owner and GC.
- G. All Equipment Checklists must be completed by the Contractor prior to scheduling of testing.

### 3.10 TRAINING

#### A. General

- 1. The CxA will review the proposed training material from the individual Contractors.
- 2. The CxA will provide comments to supplement training material for operations and maintenance personnel, where appropriate.
- 3. The Contractor for the respective system is responsible for the development and implementation of the training material for that system.
- 4. O&M manuals and training materials shall be provided to the Owner and CxA prior to training.
- 5. Training material shall include:
  - a. Detailed agenda
  - b. Contractor Contact Information Sheet
  - c. Detailed training material (divided by sections)
  - d. Log Sheets/Maintenance Checklists
- 6. Training may be recorded for future reference if requested by the Owner.
- 7. All training sessions shall be scheduled and coordinated by the GC through the Owner.

#### B. Training Topics

- 1. Description of Equipment & Systems
- 2. Warranties & Guarantees
- 3. Equipment Start-up, Shutdown
- 4. Normal & Emergency Operation
- 5. Seasonal Changeover
- 6. Maintenance Schedules

7. Health & Safety Issues
  8. Special Tools & Spare Parts
  9. Emergency Procedures
  10. Hands-on Operation
  11. Troubleshooting
  12. O&M Manuals
  13. Energy Management Control System
  14. Control Sequences
- C. Minimum Training Time
1. Div 15 –Mechanical
    - a. Mechanical Systems, air side, water side, equipment: 40 hours
    - b. Automatic temperature Controls: 40 hours
    - c. Fire Protection: 4 hours
  2. Div 16 –Electrical
    - a. Electrical Systems, normal power, equipment: 32 hours
    - b. Fire Alarm: 8 hours
    - c. Lighting Controls: 8 hours
- D. Responsibilities of Other Parties
1. GC: Responsible for training coordination and scheduling and ultimately to ensure that training had been completed.

**End of Section**



## SECTION 01 760 – SPARE PARTS & MAINTENANCE MATERIALS

### 1. GENERAL

- A. The Contractor shall furnish all labor, materials, tools, equipment and services for the provision of spare parts and maintenance materials as required in conjunction with all of the Work performed, as indicated or as required, in accordance with the provisions of the Contract Documents.
- B. Refer to the individual sections of the Technical Specifications for items of Work required.
  - 1. Spare parts shall be as specified in the Technical Specifications, or if not specifically specified, as adequate to fulfill one year's usage of such parts.
  - 2. Maintenance materials ("attic stock") shall be as specified in the Technical Specifications.

### 2. PACKAGING AND LABELING

- A. Package all parts and materials in sturdy boxes suitable in size to accommodate the quantity of items being packaged.
- B. All boxes shall have a single, standardized label which shall provide locations to write or type all necessary information. This label shall include the Project name, and shall be large enough so as to be easily read from a distance of several feet. The following information shall be included on each label:
  - 1. Manufacturer's name, part or trade name and stock number.
  - 2. The piece of equipment or finish for which the part or material is to be used.
  - 3. Name, address and phone number of the closest supplier.

### 3. DELIVERY

- A. Spare parts and maintenance materials shall be submitted directly to the County, with a letter of transmittal which shall itemize all items being submitted, and which shall be signed by an representative of the County as acknowledgement of receipt.
- B. Delivery of all parts and materials shall take place at a single time, unless previous approval is obtained from the Construction Manager. The time and location(s) of delivery shall be as determined by the County.
- C. A copy of all signed letters of transmittal shall be provided to the Construction Manager.
- D. The Contractor shall be responsible for the safe storage of all parts and materials until the designated time of inventory and acceptance by the County.

**END OF SECTION 01 760, SPARE PARTS & MAINTENANCE MATERIALS**



## SECTION 01 800 – SAFETY, HEALTH & LOSS PREVENTION PROGRAM GUIDELINES

### SAFETY POLICY STATEMENT

It is the policy of Fulton County to establish a comprehensive accident and loss prevention process for all Capital Projects implemented by Fulton County or its agents.

The goals of this comprehensive accident and loss prevention process are as follows:

- To prevent personal injury, property damage, and injury to the public.
- To implement safety and loss prevention processes as critical elements in the complete design and build process.
- To establish a proactive safety and health process that complies with all laws, regulations, consensus standards, and good management practices.
- To have the Contractors partner with Fulton County in the implementation of a Safety and Loss Prevention Process and Owner Controlled Insurance Program to minimize loss potential and to minimize risk.

Fulton County requires safety, health and loss prevention requirements and expectations to be included in project design, in the invitation to bid, in bid award and project meetings, and in the post job evaluations. The Contractor is required to develop and submit a project safety and health program for acceptance by Fulton County prior to Notice to Proceed. The Contractor is required to implement these requirements, and develop a management system to ensure compliance following the safety and health process outlined in this document and the bid documents.

The Contractor and other entities placed under contract with Fulton County will be obligated to implement, adhere to and enforce this Policy. The safety and health of the Contractor's employees, Sub-Contractors, and the public are the sole responsibility of the Contractor. The County may use and direct designated Representatives to implement and enforce this policy. **Failure of the Contractor to comply with this policy or any Safety related obligations may be grounds for contract termination.**

Safety Professionals, Fulton County's designated Representative and Insurance Carrier will periodically inspect all Fulton County construction projects to identify safety hazards and make recommendations to resolve the issues. Contractor will be responsible for abating the identified issues in a timely manner, and submitting written description of corrective action within 48 hours to Fulton County designated Representatives. Failure to bring timely resolution to the issues may result in work stoppage at Contractor's expense.

Prior to commencing work under this contract, Contractor's Project Manager and Project Superintendent shall attend a Pre-Construction Meeting and Safety Pre-Planning meeting to address insurance and safety issues/requirements.

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## CONTRACTOR SAFETY AND HEALTH MANAGEMENT PROCESS

### 1.0 NOT USED

### 2.0 REFERENCES

- 1.1 Occupational Safety and Health Regulations (OSHA) 29CFR1910 and 29CFR1926
- 1.2 Environmental Protection Agency Regulations (EPA) 40CFR
- 1.3 Fulton County Safety and Health and Requirements
- 1.4 Georgia Department of Transportation Regulations and Requirements
- 1.5 US Department of Transportation Requirements
- 1.6 Manual of Uniform Traffic Control Devices for Streets and Highways (ANSI D6.1)
- 1.7 Georgia Department of Natural Resources Environmental Protection Division Regulations

Safety rules and regulations will be followed using federal, state or local regulations in force. Should a Contractor's rule be in use which is more effective, the most stringent rule or regulation will be enforced by the Contractor, Sub-Contractor's and Fulton County designated Safety Representative(s).

### 3.0 RESPONSIBILITY

The Contractor receiving the bid has the ultimate responsibility for the safety and health of all Sub-Contractors, all employees on the project, and the general public and complying with all governmental regulations and requirements (OSHA, EPA, DOT, state, local). Nothing contained herein shall relieve the Contractor or any Sub-Contractor of such responsibility or liability.

### 4.0 PROCEDURE

- 4.1 The Contractor and each Sub-Contractor must implement a written safety and health prevention process and program following the guidelines contained in this document and in any other relevant portion of the Contract Documents. This program must be accepted by Fulton County or its Representatives prior to Notice to Proceed.
- 4.2 The Contractor and each Sub-Contractor must implement a drug and alcohol policy following the guidelines contained in this document and in the bid specific actions. This program must be accepted by Fulton County or its Representatives prior to Notice to Proceed.
- 4.3 The Contractor must designate a person responsible for site safety. Each Sub-Contractor must designate a person responsible for site safety.
- 4.4 Not Used.
- 4.5 Contractor is responsible for providing all necessary safety supplies and personal protective equipment required to protect its employees, Sub-Contractors, and the general public.
- 4.6 Contractor shall make available certified First-aid services, First-aid supplies, and provisions for medical care for all employees at the construction site prior to beginning work on site.
- 4.7 Contractor shall maintain a competent person at the construction site at all times with an OSHA 10-hour certification. Said person shall have the knowledge to recognize hazards or potential hazards and has the authority to correct such hazards.

- 4.8 The status of project safety shall be included in the Contractor's agenda, which is required in Progress Meetings.

## 5.0 DRUG AND ALCOHOL POLICY

The Contractor and each Sub-Contractor must implement a drug and alcohol policy in order to maintain a safe and efficient work environment. This policy must include the following elements.

1. Written policy that prohibits the use, transportation, sale and possession of these materials.
2. Disciplinary action plan for violations
3. Any treatment or reinstatement/reemployment options
4. Drug and alcohol testing schedule that includes pre-employment, periodic for safety sensitive or critical jobs, and for cause

Note: AGC, ABC and/or Fulton County programs may be used as guidance documents.

## 6.0 OTHER CONTROLLED ITEMS

The Contractor and each Sub-Contractor is required to include in the Project Safety Program a prohibition against the use, possession, concealment, transportation, promotion or sale of the following controlled items

1. Firearms, weapons, and ammunition.
2. Switchblades
3. Unauthorized explosives including fireworks
4. Stolen property or contraband
5. Controlled chemicals or chemicals recognized as being able to be used for improper purposes.

## 7.0 EMERGENCY PROCEDURES/GUIDELINES

- 7.1 The Contractor is required to establish site specific emergency procedures in the Project Safety Program to manage emergencies that may occur at any time in the following categories:

1. Fire
2. Employee injury
3. Pedestrian injury due to work activity of any kind
4. Property damage and damage to various utilities (i.e., electrical, gas, sewerage, water, telephone or public roadways)
5. Public demonstrations
6. Bomb threats
7. Flood, Wind, Lightening, Hail
8. Terrorists Threats
9. Work place violence

- 7.2 These Emergency Procedures will be made part of the Contractor's Project Safety Program submittal and shall include but not be limited to the following elements:

1. A list of emergency phone numbers posted at the job site, along with information to be transmitted in such emergencies.
2. An incident command structure defining duties and responsibilities
3. A system to train supervisors and employees on this emergency plan
4. Procedures on how to handle emergencies including access to the site by emergency responders, accounting for workers, and securing the area.
5. Procedures for media releases. These releases must be coordinated through the Fulton County Information and Public Affairs Office in coordination with the County's designated Representative.
6. A plan that addresses serious incidents that includes notification to Fulton County, Fulton County's designated Representative, the OCIP Administrator, and the Insurance Carrier immediately after the incident.
7. A review and updating frequency that includes forwarding a copy to Fulton County and the County's designated Representative.

#### 8.0 ACCIDENT AND INCIDENT INVESTIGATION AND REPORTING

- 8.1 The Contractor is responsible for reporting all accidents and incidents on the project site to the County's designated Representative within (1) business day. Accidents or incidents resulting in a fatality, property loss in excess of \$5,000, or involvement with the general public must be reported immediately to Fulton County's designated Representative and the investigation of the accident or incident coordinated with Fulton County Safety staff and Insurance Carrier.
- 8.2 The Contractor will maintain a log of all injuries that occur on the job site. This log will be current and available for review.
- 8.3 For any incidents such as fires, explosions, fatalities, etc., the Contractor must notify Fulton County's designated Representative immediately and must coordinate any releases to the news media through the County's designated Representative and the County's Information and Public Affairs Office.
- 8.4 If a work-related injury should occur on this project, Contractor shall perform a thorough investigation of the incident and document the information on a worker's compensation 1<sup>st</sup> Report of Injury. This report shall be submitted to the Insurance Carrier within 24 hours of the incident.
- 8.5 A written accident investigation report containing the following information as a minimum must be forwarded to the Fulton County's designated Representative and OCIP Administrator within 24 hours of incident.
  1. Company Name
  2. Location
  3. Date and Time of incident
  4. Description of incident
  5. Names of all parties involved and all witnesses
  6. Corrective action(s) taken to prevent recurrence
  7. If the incident involves injury or illness, the following information must be provided:

- (1) A medical description of the injury or illness
  - (2) OSHA recordability status i.e. first aid, medical treatment, lost time, days of restricted work.
  - (3) If the public is involved, information about treatment and treatment location.
8. Any pictures, site drawings, etc. if they assist in describing the incident.

If the investigation cannot be completed in 24 hours, a preliminary report marked as such shall be forwarded and the report completed and forwarded as soon as possible.

## 9.0 JOB SAFETY ANALYSIS

- 9.1 The Contractor and each Sub-Contractor must implement a procedure to conduct a written job safety analysis or job hazard analysis for all project work tasks prior to beginning each task. Reference Appendix A.
- 9.2 The job safety analysis should follow National Safety Council, AGC, or other recognized guidelines and address all safety and health hazards for the work, identify personal protective and other safety equipment required, identify potential hazards to the general public if applicable, and identify any safety equipment, training, or controls that must be implemented prior to starting the work.
- 9.3 The Contractor must maintain a file for all job safety analysis forms, which is accessible for review.

## 10.0 SAFETY AND HEALTH COMPLIANCE AUDITING

### 10.1 Self Auditing Requirements

- 10.1.1 The Contractor and each Sub-Contractor must implement a procedure to assure that written safety and health audits or inspections are conducted at least biweekly (every 2 weeks). Safety checklists used by Fulton County's designated Representative may be used. The Contractor may use this checklist or an equivalent approved by Fulton County's designated Representative.
- 10.1.2 Each written safety audit must be filed on the site and a copy forwarded to Fulton County designated Representative. This audit will be routed to Fulton County's Insurance Carrier for review and comment and then filed in the Construction Project files.

### 10.2 NOT USED

### 10.3 INSPECTIONS BY REGULATORY AGENCIES

- 10.3.1 The Contractor must notify the Fulton County designated Representative whenever an OSHA compliance officer, health inspector, or EPA or Georgia

Environmental Protection Division Representative arrives at the project site to conduct an inspection.

- 10.3.2 The Contractor is required to forward a copy of all regulatory citations, notice of violations, or similar for this project to Fulton County's designated Representative. Copies must be forwarded to the Insurance Carrier.
- 10.3.3 These records will be reviewed with Fulton County designated Representative and included in the Construction Project files.

#### 10.4 SAFETY INSPECTION AND AUDIT FOLLOW UP

- 10.4.1 Every safety audit or regulatory inspection conducted per the requirements above may be reviewed by the Fulton County designated Representative and/or Insurance Carrier loss control staff. This review may identify serious and repeat safety items, look at trends, identify risks and potential losses, and site safety and loss prevention activities.
- 10.4.2 After this review the findings may identify areas needing improvement.
- 10.4.3 A copy of the audit and any areas identified, as needing improvement will be forwarded to the Contractor's senior management.
- 10.4.4 For findings that indicate major loss potential or serious concerns about site safety, the areas identified as needing improvement and the overall performance may be reviewed in a meeting with the OCIP Administrator, Fulton County's designated Representative, and the Insurance Carrier loss control staff. A written action plan to address the Contractor's performance issues may be developed.
- 10.4.5 Fulton County or designated Representative may meet the Contractor's senior management to discuss the findings, contract requirements, and their plans to address the findings.
- 10.4.6 The number and frequency of safety audits and site visits may be increased until improvements are noted.

#### 11.0 SAFETY MEETINGS

- 11.1 The Contractor will conduct weekly safety meetings with all Contractor and Sub-Contractor employees on the site.
- 11.2 The Contractor will keep safety-meeting records that include meeting topic(s), outline of items discussed, and attendance and sign in sheet. At this meeting any accidents or audit findings and corrective actions from the previous week will be discussed.
- 11.3 The Contractor will maintain a job site file that contains copies of the safety meeting records.

#### 12.0 TRAINING, INSPECTION AND CERTIFICATION

- 12.1 Employee Training

- 12.1.1 The Contractor must be able to show when requested the required safety training for all Contractor and Sub-Contractor employees and competent persons working on the site including any required craft training.
  - 12.1.2 The Contractor must be able to show when requested that all employees operating mobile equipment or cranes have met or exceeded training and licensing requirements.
  - 12.1.3 The Contractor must be able to show when requested that all scaffolds are erected under the direction of a competent scaffold builder, that all users are properly trained, and that the scaffold is inspected daily.
  - 12.1.4 The Contractor shall ensure that each employee is properly trained in the recognition and avoidance of unsafe conditions and the regulations applicable to his or her work environment to control or eliminate any hazards or other exposure to illness or injury.
  - 12.1.5 If Contractor or Sub-Contractor employs anyone who cannot effectively communicate using the English language, a translator must be maintained on site who can relay instructions, questions, or concerns in a manner that the non-English and English-speaking employees will understand. The identification of this translator shall be provided to Fulton County's designated Representative.
  - 12.1.6 Contractor shall orient all supervision and employees concerning safety requirements before working on the project site.
- 12.2 Equipment Certification and Inspection
- 12.2.1 The Contractor must be able to document that all cranes and mobile equipment used on the job site have current inspections and certifications.
  - 12.2.2 The Contractor must assure that required daily and weekly equipment inspections are performed and documented in writing per governmental regulations and the requirements of this policy.
  - 12.2.3 The Contractor must maintain a job site file for these required inspections and certifications.
  - 12.2.4 Equipment identified as having safety problems or not meeting standards or codes shall be tagged as defective and shall not be used until those identified items have been corrected.
  - 12.2.5 Contractor shall maintain, and have available for viewing, safety inspection reports for ladder, electrical cords, scaffolds, and trenches/excavations.
- 13.0 SAFETY AND HEALTH PROGRAM ELEMENTS
- Note: Based on the project work activities and scope of work, some program elements may be not applicable to the project work and therefore do not have to be implemented. Elements marked with an asterisk are applicable to all Projects.

13.1 Return to Work Policy\*

The Contractor and each Sub-Contractor will be required to establish a transitional work program for employees injured at work, which provides modified duty within the employee's physical limitations.

13.2 Fire Prevention Program\*

The Contractor and each Sub-Contractor will be required to submit a temporary fire protection plan to be in effect for the duration of the contract. This plan must be submitted as part of the Contractor's Safety Program submittal. It must include provisions for fire protection systems and equipment, as identified in OSHA Safety and Health for Construction 1926, Sub-Part F, Fire Protection and Prevention.

13.3 Hazard Communication (HAZCOM)\*

The Contractor and each Sub-Contractor shall have a written HAZCOM Program. The program shall meet OSHA 1926 Requirements and provide for training so that all employees will be able to:

- Understand the program and identify hazardous chemicals with which they work.
- Understand product-warning labels.
- Have MSDSs for all potentially hazardous materials brought onto, used on, or stored at the job site.
- Know the physical location of the Material Safety Data Sheets (MSDS).

13.4 Personal Protective Equipment(PPE)\*

All Contractor and Sub-Contractor employees and other site visitors will be required to wear the PPE necessary to accomplish the work in a safe manner. PPE required will vary from job to job and must be based on a written hazard assessment. A list of PPE that is required is identified below:

- Hard Hats shall be worn at all times on all projects
- Hearing Protection for operations that create noise in excess of 85 dBA is required.
- Contractor shall provide eye or face protection equipment when machines or operations present potential eye or face injury from physical, chemical, or radiation agents.
- Work boots or work shoes made of leather shall be required. No open toed shoes or canvas shoes are allowed
- Shirts with sleeves at least 4 inches long are required. Tank tops and mesh shirt are not allowed.
- Full Body Safety Harnesses with shock absorbing lanyards for fall protection are required.
- Full body and chemical splash protection is required when handling hazardous chemicals.
- Respirators are required when employees maybe exposed to dust and/or chemicals in excess of the OSHA permissible exposure limits.

- Long pants are required.

### 13.5 Confined Space Entry

If the project work involves permit required confined spaces, a permit required confined space entry program that meets OSHA requirements must be established. This program must include but is not limited to the following elements.

- Confined Space Identification
- Environmental Testing
- Rescue
- Communication with employees in the confined space
- Employee Training
- Permit System for entry

### 13.6 Excavations

If the Contractor or Sub-Contractor must make a cut, cavity, trench or depression in an earth surface formed by earth removal, the work must comply with the OSHA Regulations on trenching and excavations. A competent person must be assigned for each excavation. Requirements include but are not limited to

- Employee Training
- Daily inspections
- Soil testing
- Protective or support systems.

### 13.7 Electrical Tools, Equipment, and Systems\*

- The Contractor and each Sub-Contractor must implement Assured Grounding Program or use Ground Fault Circuit Interrupter (GFCI) devices on all electrical tools and extension cords.
- All electrical work must be performed in accordance with the National Electrical Code (NEC) and OSHA.
- All electrical tools and extension cords must be in good repair and the Contractor must establish a written inspection program for all electrical tools. The frequency of inspection shall be at least monthly.

### 13.8 Lockout/Tagout Procedure

The Contractor and each Sub-Contractor will be required to implement a written Lockout/Tag procedure that meets OSHA requirements if their work requires energy isolation. Program elements include but are not limited to the following:

- Energy isolation lists for each piece of equipment
- Employee training
- Individually keyed locks and danger tags

- Written Procedure that assigns responsibilities

#### 13.9 Fall Protection\*

Contractor shall provide an approved fall protection system for all employees working at an elevation of 6 feet or higher on this project, including scaffolding work and steel erection. Employees will be responsible for utilizing the fall protection 100% of the time. Sub-Contractor will be responsible for ascertaining their employees' compliance with this requirement. The plan must address the following items:

- Only full body harnesses with shock absorbing lanyards and double locking hooks shall be use.
- Falls should be limited to less than 6 feet such than employee can neither fall more than 6 feet nor contact any lower level.
- Fall protection systems must be planned into the job and must be designed to handle loads and forces expected. The project goal is 100% fall protection.
- Employee training and enforcement of these requirements are mandatory to assure an effective program.

#### 13.10 Scaffolding\*

All scaffolds and work platforms shall be constructed to meet the requirements of OSHA 1926.451 and ANSI A10.8. Some program elements include but are not limited to

- User training for all employees who may use scaffolds
- Scaffolding is to be designed and erected by competent person(s) following manufacturer's guidelines. Employees must use fall protection when erecting scaffolding.
- Daily inspection by competent person. Must implement daily tag system to document inspection.
- Must have engineering approval for scaffolds above 100 feet in height.
- Must be able to document competent person credentials.
- Scaffolds must have proper egress (ladder/stairs) and should have guardrails, complete deck, toe boards and netting if anything can fall on people below. If guardrails or decking is not complete, fall protection must be used.

#### 13.11 Cranes And Other Lifting Devices

- Trained and experienced operators shall operate Cranes in accordance with the applicable OSHA and ANSI/ASME.
- The Contractor is responsible for ensuring that the crane is properly sized for the job and that all required inspections and maintenance required by OSHA and ANSI/ASME standards have been conducted.
- All cranes should have anti-two block devices installed and operational. Cranes lifting

employees in personnel baskets must have an anti-two block device to stop the crane if this condition occurs (positive acting).

- Tag lines are required to secure materials while being moved or handled by cranes.
- All cranes working in the vicinity of overhead power lines shall be grounded and be equipped with proximity guards.
- A lift plan must be submitted for all lifts that exceed 20,000 pounds or 75% of the crane's lift capacity. This plan must be reviewed and approved by the Contractor.
- Slings, hooks, and other lifting devices must be inspected on regular basis and stored properly.

#### 13.12 Use Of Personnel Baskets

- Personnel baskets should only be used as the last practical means after documenting that all other means are unacceptable.
- The personnel basket must be manufactured, tested, and used in accordance with OSHA 1926.550. The crane lifting the basket must also meet OSHA requirements.

#### 13.13 Personal Lifts With Articulating Booms (Jlg) And Scissors Lifts

- Operators must be trained in the safe operation of the lift including daily inspection procedures prior to use.
- Operators of JLG lifts must wear a full body harness with shock absorbing lanyard and be tied off while the lift is operation. Operators in a scissors lift must use fall protection anytime the guardrail system removed or altered.

#### 13.14 Ladders\*

- Ladders are acceptable means of access when used in compliance with OSHA 1926.1053.
- Ladders must be in good repair, have safety feet and be inspected.
- Extension ladders must be either held by an employee on the ground or tied off at the top.
- Homemade ladders not meeting OSHA requirements should not be used.
- Non-conducting ladders are required for electrical work.
- Fall protection is encouraged for employees working on ladders especially if they will be leaning and turning in their work activities.

#### 13.15 Tools And Equipment\*

All tools and equipment used on the project must be in a safe operating condition, with all guards in place, and must meet or exceed all governmental regulations (OSHA, EPA, DOT, etc.). Tools and equipment must be maintained, inspected, tested, and used in accordance with OSHA regulations.

13.16 Compressed Gas Cylinders\*

- Compressed gas cylinders must be used, stored, and transported in accordance with OSHA requirements, DOT requirements, and Compressed Gas Association standards.
- Fuel and oxygen cylinders must be store separately or separated by a ½ hour rated firewall.
- Compressed gas cylinders are not allowed inside confined spaces.

13.17 Welding, Burning, And Cutting\*

- The Contractor's program must meet or exceed OSHA and NFPA requirements.
- All flammables must be removed from work area and a fire watch posted in area until 30 minutes after the job is completed.
- At a minimum a 10 LB ABC rated fire extinguisher must be available in the immediate work area.
- Regulators must be in good working order and must have anti-flash back and check valves.
- Welding shields and burning goggles must be used.

13.18 Sanitation And Housekeeping\*

- The project site shall have an adequate number of portable toilets and hand washing facilities.
- The project site must establish a housekeeping plan that includes daily site clean up and trash and debris removal.

13.19 Hearing Conservation\*

The Contractor and each Sub-Contractor who has employees exposed to noise levels exceeding 85 dBA must establish a hearing conservation program that meets or exceeds OSHA requirements. Minimum program elements include audiometric testing, noise monitoring, use of hearing protectors, and employee training.

13.20 Respiratory Protection

The Contractor and each Sub-Contractor who has employees who wear respiratory protection must implement a respiratory protection program that meets or exceeds OSHA requirements. Minimum program elements include risk based respirator selection, medical surveillance, employee training, respirator fit testing, and written operating procedures.

14.0 SPECIALIZED SAFETY PROGRAM ELEMENTS

If required by the project scope of work and specific work site or activities, specialized programs listed below shall be included in the Contractor's Safety Program submittal. The Contractor is required to implement the required programs and assure that they meet or exceed all contractual, regulatory and Fulton County's requirements applicable. Details for specific program elements may be included in the contract documents.

- 14.1 Asbestos Removal
- 14.2 Lead Based Paint Removal
- 14.3 Exposure Assessment and Employee Monitoring (Industrial Hygiene)
- 14.4 Hazardous Waste Operations and Training
- 14.5 Overhead Power Lines
- 14.6 Locating underground utilities
- 14.7 Dust Control
- 14.8 Guarding for floor holes and roof openings
- 14.9 Heavy Equipment, Truck and Earth Moving Equipment requirements
- 14.10 Environmental Requirements

#### 15.0 ROAD AND TRANSPORTATION SAFETY REQUIREMENTS

The Contractor shall implement the following into its safety program whether required by the contract or any other authority having jurisdiction if required to perform the work and maintain vehicular and pedestrian traffic safety:

- 15.1 Barricades and Cones
- 15.2 Traffic and Warning Signs
- 15.3 Traffic control devices
- 15.4 Equipment and materials storage
- 15.5 Reflective Clothing and other personal protective equipment
- 15.6 Excavation and road hole protection
- 15.7 Erosion protection
- 15.8 Trained flaggers

#### 16.0 ADDITIONAL REQUIREMENTS TO PROTECT THE GENERAL PUBLIC

Based on the Contractor's scope of work and specific work activities or location the Contractor may be required to implement the following into its safety program to protect the general public:

- 16.1 Fencing and other measures for site security
- 16.2 Warning, direction and no trespassing signs
- 16.3 Alternate public walk ways
- 16.4 Protection of the public from over head and other construction hazards
- 16.5 Site Traffic Control
- 16.6 Barricading off hazardous areas and open pits and holes



**Section 01 800, Exhibit A - Job Safety Analysis Worksheet Example and Information**

Job Safety Analysis/ Job Pre-Planning Worksheet

Job Name and #:		Completed By:	
Date:		Phase/Operation:	
Task	Hazard	Control	

PRE-OPERATIONAL PLANNING

FACT FINDING GUIDE - GL

I. Evaluate present conditions at job site to determine items that could lead to liability claims during work and after completion of the project.

A. PRESENT OCCUPANCY OR USE OF THE SITE

- Demolition to be done?
- Structures will remain (condition)?

B. HISTORY OF THE SITE

- For what was the site used before?
- Underground tanks?
- Underground utilities?

C. GEOLOGY OF THE SITE

- Rock to be blasted?
- Water to be removed/diverted?
- Fill needed? (where and how obtained?)
- Excavation needed? (where and how disposed of?)

II. Evaluate controls needed in reference to site security and public protection.

A. FENCING NEEDED?

B. ACCESS/GATES

- Can traffic be routed past office or checkpoint?
- "Non-Vendor" visitors escorted?
- Gate lockable after hours?
- "Hard Hat" signs at entrance?
- Dirt removal/tarping area at exit?
- Ready Mix chute wash area?

C. PEDESTRIANS

- Sidewalk maintained outside fence?
- Covered sidewalk needed?
- Special access requirements for neighboring occupants?
- Special after-hours considerations?

D. ENVIRONMENTAL

- Dust control?
- Silt control?
- Mud control on streets?
- Vibration control?

E. UTILITIES

- Underground utilities located?
- Overhead power lines in work area relocated, removed, or deenergized?
- Temporary power service away from high traffic areas?

F. SUB-CONTRACTORS

- Method to secure proof of adequate insurance coverage in place?
- List of hazardous materials obtained?
- List of hazardous materials provided?
- Responsibilities established
  - Job site safety meetings
  - Materials delivery
  - Debris removal
  - Access to site
  - Weekly Sub-Contractors' meetings
  - Schedule of safety inspections
  - Emergency Procedures

G. MATERIALS HANDLING

- Crane selection criteria established
  - Maximum weight to be handled
  - Maximum lifting height
  - Maximum horizontal reach needed
  - Amount of travel needed
  - Swing radius available
  - Set-up area available
  - Ground bearing capacity
  - Approximate frequency of lifts
- Crane operations responsibilities established
  - Triangle or leasing company crane to be used?
  - Operator trained and experienced on specific machine?
  - Operator can accurately read and interpret machine load chart?
  - Critical lift identified (75% of net capacity)?
  - Machine fully inspected by a qualified outside agency?
  - Rigging hardware properly selected?
  - Inspecting and maintaining the crane per owner/manufacture specifications?

III. Start Up.

A. ELECTRICAL

- Temporary Power
  - Underground service possible?
  - Maintenance responsibilities established?
  - Main circuit panel barricaded?
  - Lighting planned?

- Circuit Protection
  - Ground fault circuit interrupt protection?
  - Assured grounding conductor program?
  - Responsibilities established?

**B. FIRE PROTECTION**

- ABC extinguishers adequately distributed?
- Properly sized?
- Maintenance of fire extinguishers?
- Stand pipe/hydrant available? Adequate?
- Housekeeping checks/inspections?

**C. FALL PROTECTION**

- Critical Job Phases Identified?
  - Critical exposures identified by phase? (e.g. "Worker falls into basement excavation")
  - Scheduled start dates for critical phases?
- General Fall Protection Procedures
  - Perimeters
  - Floor openings
  - Working deck
  - Work area access
  - Ladders
  - Elevator hatchways

**D. PERSONAL PROTECTIVE EQUIPMENT**

- General
  - Hard hats
  - Work shoes
- Specific by Task

**E. HAZARD COMMUNICATION PROGRAM ESTABLISHED AND EMPLOYEES TRAINED**

**F. CONFINED SPACE ENTRY**

- Procedures established and task(s) identified requiring use of procedures?

**G. TRENCHING**

- Procedures established and task(s) requiring procedures identified?

**H. PHASE PRE-PLANNING**

- Job schedules established?
- Agreed upon target dates for meeting?
- Follow up system

**END OF SECTION 01 800, SAFETY, HEALTH & LOSS PREVENTION PROGRAM  
GUIDELINE**



SECTION 01 910 – GEOTECHNICAL REPORT

Follows:

Report of Geotechnical Exploration for the SW Arts Phase II (32 pages)  
United Consulting. November 7, 2002

END OF SECTION 01 910 – GEOTECHNICAL REPORT



**REPORT OF**

  
NOV 2002  
POUNDS-HARRIS-MHR  
PROGRAM MANAGERS

**GEOTECHNICAL EXPLORATION  
ON THE  
SW ARTS PHASE II  
925 NEW HOPE ROAD  
ATLANTA, FULTON COUNTY, GEORGIA**

**PREPARED FOR**

**MR. BILL POYNTER  
POUNDS HARRIS MHR  
141 PRYOR STREET, SUITE 8053  
ATLANTA, GEORGIA 30303**

**PROJECT NO. 2002.2480.01**



**UNITED CONSULTING**



*We're here for you*

**UNITED CONSULTING**

November 7, 2002

Mr. Bill Poynter  
Pounds Harris MHR  
141 Pryor Street, Suite 8053  
Atlanta, Georgia 30303

RE: Report of Geotechnical Exploration  
SW Arts Phase II  
925 New Hope Road  
Atlanta, Fulton County, Georgia  
Project No. 2002.2480.01

Dear Mr. Poynter:

United Consulting is pleased to submit this report of our Geotechnical Exploration for the above referenced project. This report includes a review of the scope of work, a summary of site conditions, a discussion of subsurface conditions, and preliminary recommendations for foundation design, earthwork and excavation.

We appreciate the opportunity to assist you with this service and look forward to working with you on future projects. Please contact us if you have any questions regarding this report or if we can be of further assistance.

Sincerely,

UNITED CONSULTING

*Mehdi Moazzami*  
Mehdi Moazzami, P.E.  
Project Engineer



*Chris L. Roberds*  
Chris L. Roberds, P.G.  
Executive Vice President

MM/CLR/tmg

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## FIGURES

Figure 1      Boring Location Plan

## APPENDIX A

General Notes/Narrative of Drilling Operations  
Exploration Procedures  
Logs of Borings (B-1 to B-13)  
Moisture Density Test Report (1)

## APPENDIX B

Laboratory Testing Procedures  
Natural Moisture Test  
Standard Proctor Tests



## EXECUTIVE SUMMARY<sup>1</sup>

A geotechnical exploration has been completed on the SW Art Phase II located at 925 New Hope Road in Fulton County, Georgia. The text of the report should be reviewed for a detailed discussion of the items summarized below.

1. A complete geotechnical engineering service is performed through the Observational Method as an indivisible two-phase process. The first phase provides advice about project specific risks and represents our firm's opinion of subsurface conditions. Field observation during construction comprises the second phase of our service and provides us the opportunity to assess the reliability of the subsurface data and the appropriateness of our recommendations. Actual conditions may differ from those encountered in the exploration phase.
2. Possible fill of up to 3.5 feet was encountered in one of the borings. Based on the provided site plan, this area is within the utility trench excavation and therefore, probably should not be of significant concern. However, this boring did encounter auger refusal at a depth of 4 feet. Auger refusal could represent unsuitable material, boulders, massive rock, or other hard objects. Standard Penetration Test borings alone cannot sufficiently determine the quality of the possible fill. Test pits could be excavated to further determine the quality of the possible fill and auger refusal materials.
3. During wet weather, the condition of the subgrade soil should be expected to deteriorate, if not well protected. If wet these soils may not be feasible for re-use as engineered fill.
4. Conventional shallow foundations such as spread footings and/or continuous strip footings should be suitable to support the planned structures, provided the site is prepared as recommended. Depending on the final grades, an allowable soil bearing pressure in the range of 2,500 to 3,000 psf should be available for foundation design.
5. Partially Weathered Rock (PWR) and rock were encountered within eleven of the borings drilled at the Project Site. Therefore, depending on the final grades and profile of the utility lines, difficult excavation associated with PWR and rock could occur.
6. Groundwater was not encountered in borings, at the time of drilling. However, due to presence of shallow PWR and rock, perched water may be encountered.

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<sup>1</sup> This Executive Summary is not intended to be used or relied upon without reference to the entire report and cannot otherwise be properly understood and interpreted. It is provided solely for the convenience of the Client and not as a substitute for the report or review of the report.



## **PURPOSE**

The purpose of the geotechnical exploration was to assess the general type and condition of the subsurface materials at the project site, with particular concern for fill, soft soils, or potential difficult excavations due to partially weathered rock and/or rock. The intent is to provide generalized recommendations to guide in site preparation, earthwork and excavation, foundation design and quality assurance.

## **SCOPE**

The scope of our services included the following items:

1. Drilling thirteen (13) Standard Penetration Test (SPT) borings and three (3) offset borings to determine the general nature and condition of the subsurface soils;
2. Examining soil samples obtained during our field exploration program by a Geotechnical Engineer for further identification and classification;
3. Conducting twelve (12) natural moisture content test on selected soil samples;
4. Conducting one (1) Standard Proctor Test on a bulk sample;
5. Evaluating the existing soil conditions with respect to the proposed construction; and
6. Preparing this report to document the results of our site reconnaissance, field-testing program, engineering analysis, and recommendations for earthwork, excavation and foundation design. A narrative of field procedures is included in Appendix.

## **SITE AND PROJECT INFORMATION**

The Project Site is located at 925 New Hope Road in Atlanta, Fulton County, Georgia. More specifically the Project Site was located to the south at about 50 feet of the existing one-story building located at 925 New Hope Road. At the time of our site visit, the area of the Project Site was generally wooded, undeveloped land. A strip of landscaped area about 95 feet wide was located along the northern portion of the Project Site. Remnants of a building were located at about 50 feet south of boring B-5. The former roof was on the ground, therefore, United Consulting could not determine if any chemical or petroleum product were present under the former roof. No topographic site plan of the Project Site was available at the time of completion of this report. Based on our visual observation, the area of the Project Site slopes down to the east, south, and west.



The Project Site was bounded to the east by New Hope Road, to the south and west by undeveloped wooded land, and to the north by the existing SW Art Center building and associated drive, parking, and landscaped areas.

We understand that the proposed development will consist of construction of a new 23,400 square foot Art Center and associated drive and utilities. The building type, finished floor elevation (FFE), and foundation loadings were not available at the time of completion of this report. Based on our experience with similar type developments, foundation loadings should be on the order of 3,000 pounds per linear foot (plf) for strip footings and about 50 kips for column footings. If the building loads vary greatly from our estimate, United Consulting should be given the opportunity to re-evaluate its recommendations.

## SUBSURFACE CONDITIONS

The site is located in the Piedmont Physiographic Province of Georgia. The virgin, "residual" soils (or residuum) native to this region have been formed by the in-place weathering of the parent crystalline rock. A typical residual soil profile consists of a clayey zone from the ground surface, underlain by sandy silts and silty sands. These silts and sands often exhibit the banded appearance of the parent rock. Seams of partially weathered rock are often encountered with depth until the sound, relatively unaltered parent rock is encountered. Partially weathered rock (PWR) is a term for the residuum that can be penetrated by soil drilling techniques and has standard penetration test resistance values in excess of 100 blows per foot (bpf).

Borings encountered a layer of topsoil prior to encountering the underlying soils. Beneath the topsoil, all borings, except boring B-2, encountered residual soils. **Boring B-2 encountered possible fill soils prior to auger refusal.** Fill soils are those that have been placed by man. Undocumented fill soils can vary greatly in composition, density, compressibility, and strength. The possible fill soils encountered were generally classified as soft silt with some mica and trace amount of sand, clay, and organic material. The residual soils encountered were generally classified as firm to hard silt with varying amounts of sand, clay, mica, rock fragments, and organic materials, or loose to very dense sand with varying amounts of silt, clay, mica, and rock fragments. The Standard Penetration Test resistance (N-values) of possible fill soils was 3 bpf, and those for the residual soils ranged from 6 to 52 bpf.

PWR was encountered in borings B-2A, B-3, B-8, B-11, and B-13 from depths of 13.5, 13.5, 13, 3.5, and 13 feet below grade to boring termination depths, respectively. A lens of PWR was encountered in borings B-3 and B-5 from depths of 0.5 to 1 and 4 to 5 feet below grade, respectively. PWR encountered was generally classified as hard sandy silt with varying amounts of mica and rock fragments or very dense sand with varying amounts of silt, mica, and rock fragments.

Auger refusal materials were encountered in borings B-2, B-3, B-7, B-8, B-10, B-10A, B-11, B-11A, and B-13 at depths ranging from 4 to 18 feet below grade. Auger refusal indicates the depth at which the soil boring cannot be advanced further using conventional soil drilling procedures. It



may represent a seam of rock, a boulder or other hard obstruction, or the upper surface of relatively sound, massive rock

Groundwater was not encountered in the borings, at the time of drilling. Groundwater levels should be anticipated to fluctuate with the change of seasons, during periods of very low or high precipitation, or due to changes in the floodplain or watershed upstream from the site. For a more detailed description of the subsurface conditions encountered, please refer to the boring logs included in Appendix.

## **LABORATORY TESTING**

One Standard Proctor test was conducted in our laboratory on composite bulk samples obtained from borings B-5, B-7, and B-8 auger cuttings of the top 5 feet. The moisture density relationship curve is provided in the appendix to this report.

Twelve natural moisture tests were conducted on selected soil samples in our laboratory. The results of moisture content tests indicated that the natural moisture content of the soil samples varied from 3% to 42%. The results of the natural moisture content tests are indicated at the respective sample locations on the boring logs. The procedures for the laboratory tests are provided in the Appendix.

For detailed information about the procedures of tests, please refer to the Laboratory Testing Procedures provided in the Appendix.

## **DISCUSSION AND RECOMMENDATIONS**

The following preliminary recommendations are based on our understanding of the proposed construction, the data obtained in our soil test borings, a Site reconnaissance, and our experience with soils and subsurface conditions similar to those encountered at the Site. We recommend that United Consulting review the grading scheme and site layout once the information has been finalized.

Since the grading for the Project Site including the finished floor elevations of the building, parking areas, and the depths of utility trench excavations have not been determined, the recommendations presented in this report should be considered preliminary in nature. Once the final grades are determined, we recommend that our work be reevaluated, which may include additional borings, test pits, or ground penetrating radar (GPR) to finalize our recommendations. The Final Geotechnical Exploration will include determination of soil bearing capacity, settlement estimates, retaining wall design, slopes, etc., and other issues which cannot be determined at this preliminary stage.



We also recommend that United Consulting be consulted during construction to conduct Geotechnical Controls for the Owner's Representative. The purpose is to verify the similarity of the in-situ conditions with conditions anticipated by the designers.

### **Existing Fill Consideration**

Boring B-2 encountered possible fill to a depth of 3.5 feet. **The possible fill appeared to be soft and un-compacted.** However, it is our understanding that structures are not planned in the area of this boring. Boring B-2 encountered auger refusal at a depth of 4 feet below grade. Therefore, unsuitable materials, boulders, or massive rock may be encountered in this area. Standard Test Borings alone are not capable to sufficiently evaluate the quality of the existing fill. Test pits could be excavated to further evaluate the quality of the fill and auger refusal materials.

### **Site Preparation**

The remnants of the building located to the south of boring B-5 should be removed. The removal of this building includes removal of all associated underground structures, septic tanks, or other associated facilities, if present.

Also, all the existing trees, stumps, and topsoil including their root mats, and other deleterious material should be remove form the areas of building footprint and those areas receiving pavement. The root mat associated with trees may extend to several feet below existing grade.

After clearing, stripping, and lowering the site grade where needed, areas to receive fill, foundations, pavements, and areas of the proposed structures should be proofrolled. Proofrolling should be accomplished with a fully loaded, 20 to 30-ton, tandem-axle dump truck or its equivalent with two complete coverages in each of two perpendicular directions. Proofrolling should be performed under the observation of the Geotechnical Engineer or his representative so that if necessary, he can determine the most effective and suitable means of stabilizing any soft or wet areas that are discovered. This method may consist of undercutting and backfilling with a suitable compacted fill material, replacing with surge stone and a layer of crusher run, or some other method deemed suitable.

### **Excavation**

All excavations should be conducted in accordance with the Occupational Safety and Health Administration (OSHA) guidelines.

PWR was encountered in borings B-2A, B-3, B-8, B-11, and B-13 from depths of 3.5 to 13.5 feet below grade. Also, a lens of PWR was encountered in borings B-3 and B-5 from depths of 0.5 to 1 and 4 to 5 feet below grade, respectively. Auger refusal materials were encountered in borings B-2, B-3, B-7, B-8, B-10, B-10A, B-11, B-11A, and B-13 at depths ranging from 4 to 18 feet below grade.



No grading plan, building FFE information or utility plans and profiles were available at the time of this exploration. Therefore, the extent of difficult excavation conditions cannot be determined at this time. However, due to the number of borings that encountered relatively shallow PWR or rock, we expect that some difficult excavation (ripping and/or blasting) will be required for this project.

Conventional scrapers and loaders can generally excavate soils. PWR typically requires loosening by ripping with large dozers pulling single tooth rippers in mass excavation or blasting in confined (trench) excavation. Relatively sound, massive, rock typically requires blasting for removal in mass or trench excavation.

Excavation techniques will vary based on the weathering of the materials, fracturing and jointing in the rock, and the overall stratigraphy of the feature. Actual field conditions usually display a gradual weathering progression with poorly defined and uneven boundaries between layers of different materials. We recommend that the following definitions for rock in earthwork excavation be included in bid documents:

In Mass Excavation: Any material occupying an original volume of more than 1 cubic yard which cannot be excavated with a single-toothed ripper drawn by a crawler tractor having a minimum draw bar pull rating of not less than 80,000 pounds usable pull (Caterpillar D-8 or larger).

In Trench Excavation: Any material occupying an original volume of more than 1/2 cubic yard which cannot be excavated with a backhoe having a bucket curling rate of not less than 40,000 pounds, using a rock bucket and rock teeth (a John Deere 790 or larger).

Removal of rock by blasting can be very expensive. The costs of excavation vary with the type of material encountered and the quantities to be excavated. Hence, control of quantities is important. You may consider exposing the rock surface prior to blasting so the rock quantities can be more accurately estimated using surveying methods. Leaving soil overburden in place during blasting may result in difficulties in determination of blast rock quantities resulting in greater rock excavation costs. Also, residual soil overburden may increase the confining pressure of the rock and reduce the effectiveness of blast charges. Loose fill or blasting mats can be placed over the blast area to control fly-rock.

Ripped PWR and/or blasted rock fragments may be reused and mixed into engineered fill provided that they are pulverized to less than 6 inches in any dimension and fully choked with soil to fill voids between the rock pieces. PWR or rock greater than 12 inches in any dimension may be used in deep fill areas outside the buildings footprint and in non-structural areas and should be well choked with a geotextile fabric or a minimum 6-inch layer of crusher-run or GAB. A minimum of 4 feet of clean fill is recommended over the soil/rock fill.



## **Earthwork**

The possible fill and residual soils present at this site should generally be suitable for reuse as engineered fill provided they are moisture conditioned. Any excavated surficial soils that do not contain excessive moisture or other deleterious material should also, be suitable for reuse as engineered fill. Based on our laboratory results the moisture content of the onsite soils ranged from 3 to 42 percent. Therefore, we recommend that the grading contractor be equipped to control moisture by both drying and wetting soils. The drying can be achieved by spreading and disking soils in sunny, dry weather or by mixing wet soils with drier soils. Positive drainage should be maintained at all times to prevent saturation of exposed soils in case of rain. Rolling the surface of disturbed soils will also improve runoff and reduce the fill soil moisture and construction delays.

## **Moisture Sensitive Soils**

Most of the soils encountered at the site contained a relatively high percentage of silt. These soils are typically extremely moisture sensitive and will become unstable if exposed to moisture increases and are disturbed by construction traffic. If an unstable subgrade develops, it will be necessary to remove the unstable soils and replace them with an engineered fill. Alternatively, these materials could be stabilized in-place as determined by the Geotechnical Engineer at the time of construction. If grading/construction is planned to extend into unfavorable weather seasons (typically November thru March) it is recommended that the project budget include contingency funds to mitigate expected unstable soil conditions. The degree of soil stability problems will also be dependent upon the precautions taken by the contractor to help protect these moisture sensitive soils.

## **Dewatering**

Groundwater was not encountered in the borings, at the time of drilling. However, due to presence shallow PWR, shallow perched water may be encountered.

## **Preliminary Foundation Design**

Provided that the site is prepared as recommended in this report, and pending the Final Geotechnical Exploration, the soils at the site should be suitable to support the proposed structures on a conventional shallow foundation system. Depending on the FFE, a maximum allowable soil bearing pressure in range of 2,500 to 3,000 psf may be used for preliminary design of conventional shallow foundations bearing in suitable existing residuals soils or newly placed engineered fill.

We recommend minimum footing widths of at least 20 inches for strip footings, and 24 inches for square footings. A minimum embedment depth of 12 inches is recommended to protect against frost action.

Differing soil composition, compactive efforts in fill, and material types (i.e., fill, residuum) will result in a soil mass of variable strength and compressibility. Therefore, differential settlements



will occur. We recommend that expansion or control joints be incorporated between the floor slab and column or wall footings.

Surface water control should be maintained to prevent accumulation of water in footing excavations. Standing water in footing excavations should be removed promptly. Soil softened by the water should be removed, and the Geotechnical Engineer or his representative should re-examine the area. Our representative must evaluate each footing excavation prior to concrete placement. The conditions observed should be compared to test boring data and design requirements.

### **Fill Placement**

Moisture-density determinations should be performed for each soil type used, to provide data necessary for quality assurance testing. The natural moisture content at the time of compaction should be within moisture content limits, which will allow the required compaction to be obtained, but not in excess of three percentage points above or below the optimum moisture content.

The contractor should be prepared to increase or decrease soil water content. Typical restrictions on suitable fill are no organics, plasticity index less than 20, and maximum particle size of six inches, with not more than 30 percent greater than  $\frac{3}{4}$ -inch. Some of the fill soils encountered at the Project Site that contain organics are not suitable for reuse as engineered fill.

The fill should be placed in lifts not to exceed 8 inches loose thickness, and then compacted. We recommend that fill be compacted to at least 98% of Standard Proctor (ASTM D 698) maximum dry density within two feet below pavement subgrade or floor slabs and at least 95% of the Standard Proctor maximum dry density elsewhere. **A representative of our firm should monitor fill placement on a full time basis.** In place density tests performed by that individual will evaluate the degree of compaction being attained.

## **LIMITATIONS**

This report is for the exclusive use of Fulton County General Services and Pounds Harris MHR and the designers of the project described herein, and may only be applied to this specific project. Our conclusions and recommendations have been prepared using generally accepted standards of Geotechnical Engineering practice in the State of Georgia. No other warranty is expressed or implied. Our firm is not responsible for conclusions, opinions or recommendations of others.

The right to rely upon this report and the data within may not be assigned without UNITED CONSULTING'S written permission.

Our conclusions and recommendations are based upon preliminary information furnished us, data obtained from the previously described exploration and testing program and our experience. They do not reflect variations in subsurface conditions that may exist intermediate of our borings and



in unexplored areas of the site. A Final Geotechnical Exploration should be conducted once building FFEs and site grades have been established. Should such variations become apparent during construction, it will be necessary to re-evaluate our conclusions and recommendations based upon "on-site" observations of the conditions.

If the design or location of buildings is changed, the recommendations contained herein must be considered invalid, unless the changes are reviewed by our firm and our recommendations are either verified or modified in writing. When design is complete, we should be given the opportunity to review the foundation plan, grading plan, and applicable portions of the specifications to see if they are consistent with the intent of our recommendations.

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CLIENT: FULTON COUNTY

SCALE: 1" = 60'

DATE: 11/06/02

PROJECT NO: 2002.2480.01

TITLE: SW ARTS PHASE II

REVISIONS:

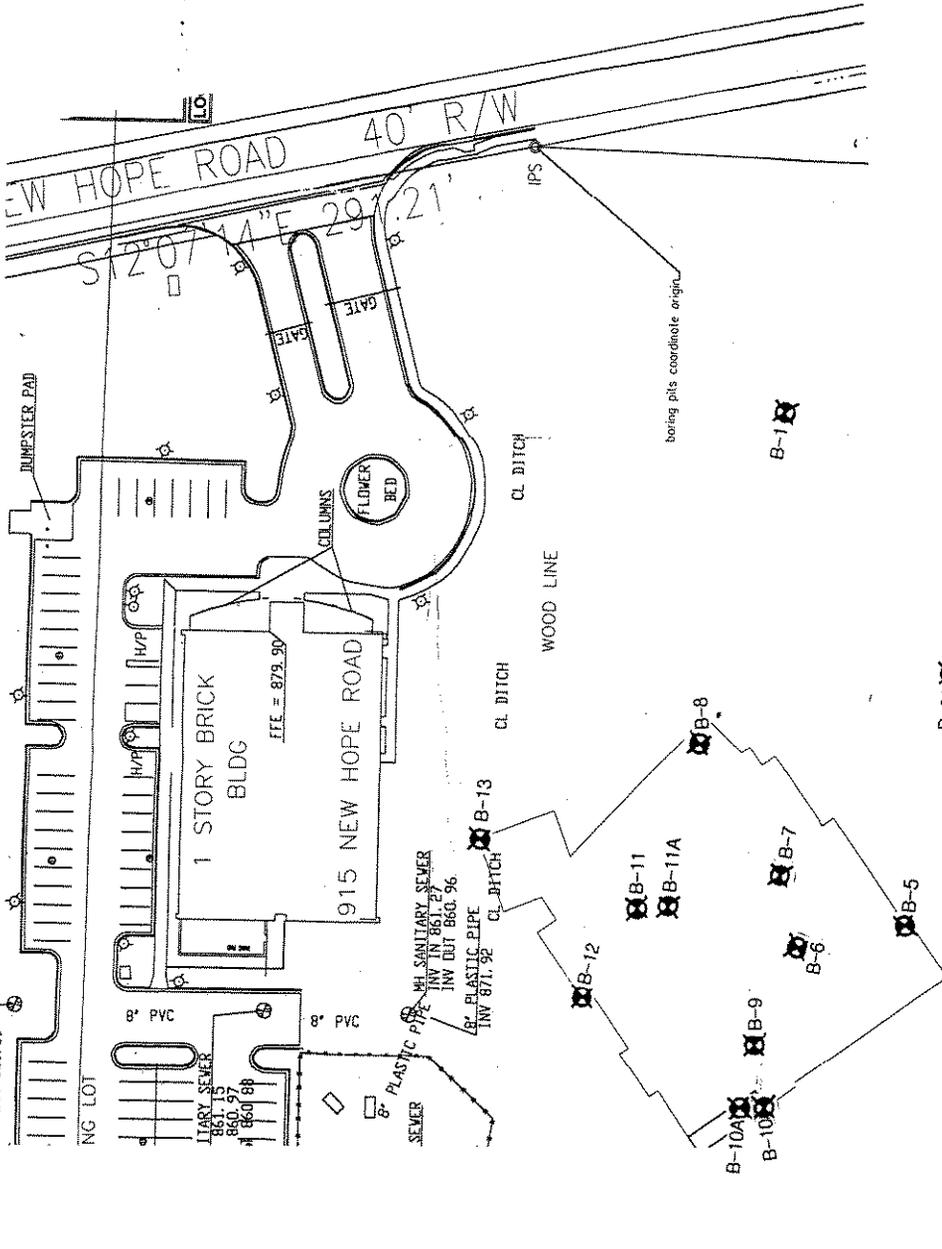
CHECKED:

NEW HOPE ROAD, FULTON COUNTY, GA

UNITED CONSULTING  
770 - 209-0029 FAX 582-2900  
E-MAIL ADDRESS UNITED@UNITEDCONSULTING.COM  
WWW.SITE WWW.UNITEDCONSULTING.COM



FIG. 1



LEGEND

BORING LOCATION



B-3

B-4



## EXPLORATION PROCEDURES

A total of thirteen (13) Standard Penetration Test (SPT) borings and three (3) offset borings were performed at this Site, at the approximate locations shown on Figure 1, Boring Location Plan. The SPT borings were performed in general accordance with ASTM D 1586. A narrative of field operations is included in the Appendix to this report. Soil samples obtained using the Split Spoon Sampler were examined by a Geotechnical Engineer and classified according to the manual-visual method described in ASTM D-2488-90.

Boring locations were determined in the field by the Geotechnical Engineer who measured distances and estimated angles from existing site features with a measuring tape and a hand-held compass. A site plan provided by the client was used as a guide. Therefore, the boring locations shown on the attached boring location plan should be considered approximate.



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# BORING LOG

CONTRACTED WITH: FULTON COUNTY

BORING NO.: B-1

PROJECT NAME: SW ARTS PHASE II

DATE: 10/29/02

JOB NO.: 2002.2480-01 DRILLER: BETTS

RIG: CME-550

LOGGED BY: P.M.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES				NOTES
			NO.	TYPE	BLOWS/6"	RECOV.	
	5" - TOPSOIL	0					
	SILT-SANDY, TRACE CLAY AND MICA; VERY STIFF; TAN-RED (RESIDUAL)		1	█	7-8-9	16	
	SAND-SILTY, TRACE MICA; DENSE; TAN-BROWN	5	2	█	12-19-25	18	15
	-GRAY	10	3	█	19-23-23	18	
	-MEDIUM DENSE; TAN	15	4	█	16-12-11	18	
	BORING TERMINATED AT 15'						
		20					
		25					
		30					
		35					
		40					

NO GROUNDWATER  
 ENCOUNTERED AT TIME  
 OF BORING



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# BORING LOG

CONTRACTED WITH: FULTON COUNTY BORING NO.: B-2  
 PROJECT NAME: SW ARTS PHASE II DATE: 10/29/02  
 JOB NO.: 2002.2480-01 DRILLER: BETTS RIG: CME-550 LOGGED BY: P.M.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES				NOTES
			NO.	TYPE	BLOWS/6"	RECOV.	
	5" - TOPSOIL	0					-BORING B-2 OFFSET 10' NORTHWEST TO BORING B-2A.  -NO RECOVERY
	SILT-SOME MICA, TRACE CLAY, SAND AND ORGANICS (ROOT HAIRS); SOFT; RED (POSSIBLE FILL)		1	█	2-2-1	16	
			2	█	50/0	0	
	AUGER REFUSAL AT 4' BORING TERMINATED AT 4'	5					NO GROUNDWATER ENCOUNTERED AT TIME OF BORING
		10					
		15					
		20					
		25					
		30					
		35					
		40					



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## BORING LOG

CONTRACTED WITH: FULTON COUNTY BORING NO.: B-2A  
 PROJECT NAME: SW ARTS PHASE II DATE: 10/29/02  
 JOB NO.: 2002.2480-01 DRILLER: BETTS RIG: CME-550 LOGGED BY: P.M.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES				NOTES
			NO.	TYPE	BLOWS/6"	RECOV.	
	6" - TOPSOIL	0					
	STRAIGHT AUGER TO 3.5'						
	SILT-SANDY, TRACE MICA; VERY STIFF; TAN (RESIDUAL)	5	1		7-7-17	18	11
	SAND-SILTY, TRACE CLAY AND MICA; DENSE; GRAY	10	2		12-15-26	18	
	PARTIALLY WEATHERED ROCK SAMPLED AS SILT-SANDY, TRACE MICA; VERY DENSE; GRAY	15	3		8-9-50/6	18	
	BORING TERMINATED AT 15'						
		20					
		25					
		30					
		35					
		40					

NO GROUNDWATER  
 ENCOUNTERED AT TIME  
 OF BORING



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# BORING LOG

CONTRACTED WITH: FULTON COUNTY BORING NO.: B-3  
 PROJECT NAME: SW ARTS PHASE II DATE: 10/29/02  
 JOB NO.: 2002.2480-01 DRILLER: BETTS RIG: CME-550 LOGGED BY: P.M.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES				NOTES
			NO.	TYPE	BLOWS/6"	RECOV.	
	10" - TOPSOIL	0					
	PARTIALLY WEATHERED ROCK SAMPLED AS SAND-SOME ROCK FRAGMENTS; VERY DENSE; TAN SAND-SOME SILT, TRACE CLAY AND MICA; DENSE; RED (RESIDUAL)		1	█	10-50/6	12	3
		5	2	█	15-17-28	16	
		10	3	█	17-21-26	18	
	-TRACE SILT; RED-BROWN						
	PARTIALLY WEATHERED ROCK	15	4	█	50/0	0	-NO RECOVERY
	AUGER REFUSAL AT 15' BORING TERMINATED AT 15'						NO GROUNDWATER ENCOUNTERED AT TIME OF BORING
		20					
		25					
		30					
		35					
		40					









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# BORING LOG

CONTRACTED WITH: FULTON COUNTY BORING NO.: B-7  
 PROJECT NAME: SW ARTS PHASE II DATE: 10/29/02  
 JOB NO.: 2002.2480-01 DRILLER: BETTS RIG: CME-550 LOGGED BY: P.M.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES				NOTES
			NO.	TYPE	BLOWS/6"	RECOV.	
	4" - TOPSOIL	0					
	SILT-SOME CLAY, TRACE SAND, MICA AND ORGANICS (ROOT HAIRS) ; STIFF; RED (RESIDUAL)		1	█	4-5-5	12	42
	-SOME SAND AND MICA, TRACE CLAY; VERY STIFF; TAN-RED	5	2	█	6-8-8	18	
	-HARD; TAN	10	3	█	17-22-14	18	
	-TRACE SAND AND ROCK FRAGMENTS; VERY STIFF	15	4	█	8-10-13	18	
	AUGER REFUSAL AT 18' BORING TERMINATED AT 18'	20					NO GROUNDWATER ENCOUNTERED AT TIME OF BORING
		25					
		30					
		35					
		40					









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# BORING LOG

CONTRACTED WITH: FULTON COUNTY BORING NO.: B-10A  
 PROJECT NAME: SW ARTS PHASE II DATE: 10/29/02  
 JOB NO.: 2002.2480-01 DRILLER: BETTS RIG: CME-550 LOGGED BY: P.M.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES				NOTES
			NO.	TYPE	BLOWS/6"	RECOV.	
	NO TOPSOIL	0					
	STRAIGHT AUGER TO 7'						
		5					
	AUGER REFUSAL AT 7' BORING TERMINATED AT 7'						
		10					NO GROUNDWATER ENCOUNTERED AT TIME OF BORING
		15					
		20					
		25					
		30					
		35					
		40					



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# BORING LOG

CONTRACTED WITH: FULTON COUNTY BORING NO.: B-11  
 PROJECT NAME: SW ARTS PHASE II DATE: 10/29/02  
 JOB NO.: 2002.2480-01 DRILLER: BETTS RIG: CME-550 LOGGED BY: P.M.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES				NOTES	
			NO.	TYPE	BLOWS/6"	RECOV.		W %
	4" - TOPSOIL	0					-BORING B-11 OFFSET 12' SOUTH TO BORING B-11A.	
	SAND-SOME SILT, TRACE CLAY; LOOSE; RED-TAN-BROWN (RESIDUAL)		1		3-3-3	14		20
	PARTIALLY WEATHERED ROCK SAMPLED AS SAND-SOME SILT, TRACE MICA; VERY DENSE; TAN-GRAY	5	2		50/5	5		
	AUGER REFUSAL AT 8' BORING TERMINATED AT 8'	10						
		15					NO GROUNDWATER ENCOUNTERED AT TIME OF BORING	
		20						
		25						
		30						
		35						
		40						



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# BORING LOG

CONTRACTED WITH: FULTON COUNTY BORING NO.: B-11A  
 PROJECT NAME: SW ARTS PHASE II DATE: 00/29/02  
 JOB NO.: 2002.2480-01 DRILLER: BETTS RIG: CME-550 LOGGED BY: P.M.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES				NOTES
			NO.	TYPE	BLOWS/6"	RECOV.	
	NO TOPSOIL	0					
	STRAIGHT AUGER TO 8.5'						
		5					
	SAND-SILTY, TRACE MICA; FIRM; TAN (RESIDUAL)	10	1		8-9-10	18	
	-SILTY, SOME ROCK FRAGMENTS, TRACE MICA; MEDIUM DENSE; TAN-BROWN	15	2		13-12-13	18	
	AUGER REFUSAL AT 18' BORING TERMINATED AT 18'	20					NO GROUNDWATER ENCOUNTERED AT TIME OF BORING
		25					
		30					
		35					
		40					





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# BORING LOG

CONTRACTED WITH: FULTON COUNTY BORING NO.: E-13  
 PROJECT NAME: SW ARTS PHASE II DATE: 10/29/02  
 JOB NO.: 2002.2480-01 DRILLER: BETTS RIG: CME-550 LOGGED BY: P.M.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES				NOTES
			NO.	TYPE	BLOWS/6"	RECOV.	
	2" - TOPSOIL	0					
	SAND-SILTY, TRACE CLAY AND MICA; MEDIUM DENSE; RED-TAN (RESIDUAL)		1	█	10-10-10	14	26
	-SOME SILT, TRACE MICA; DENSE; GRAY-PINK	5	2	█	10-16-19	15	
	SILT-SANDY, TRACE MICA; VERY STIFF; TAN-GRAY						
		10	3	█	6-8-9	18	
	PARTIALLY WEATHERED ROCK SAMPLED AS SAND-SOME SILT, TRACE ROCK FRAGMENTS AND MICA; VERY DENSE; GRAY-PINK	15	4	█	50/5	5	
	AUGER REFUSAL AT 16' BORING TERMINATED AT 16'						NO GROUNDWATER ENCOUNTERED AT TIME OF BORING
		20					
		25					
		30					
		35					
		40					

# MOISTURE-DENSITY TEST REPORT

Curve No.: 1

Date: 10/31/02

Project No.: 2002.2480.01

Project: SW ARTS PHASE II

Location: B-5; B-7; B-8

Elev./Depth: 0-5 (FT)

Sample No. 1

Remarks:

## MATERIAL DESCRIPTION

Description: VISUAL, BROWN SILT SOME SAND AND CLAY

Classifications -

USCS:

AASHTO:

Nat. Moist. = 26.10 %

Sp.G. = 2.65

Liquid Limit =

Plasticity Index =

% > No.4 = %

% < No.200 =

## TEST RESULTS

Maximum dry density = 90.1 pcf

Optimum moisture = 28.1 %

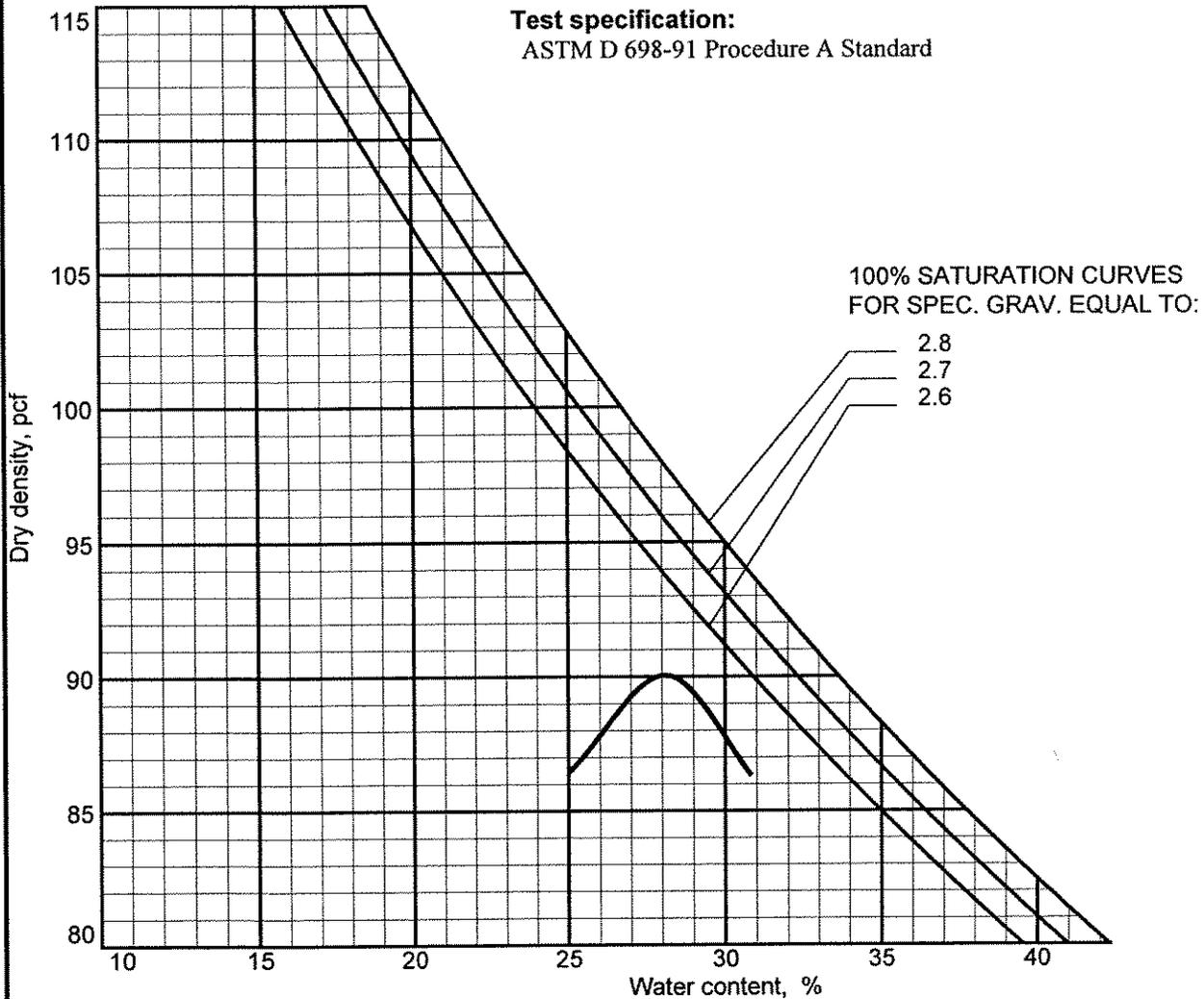


Figure 1

## LABORATORY PROCEDURES

### Moisture Content

The moisture content was determined for selected soil samples obtained in the split spoon and bulk samples. A representative portion of each sample was weighed and then placed in an oven and dried at 110 degree Centigrade for at least 15 to 16 hours. After removal from the oven, the soil was again weighed. The weight of the moisture lost during drying thus was determined. From this data, the moisture content of the sample was then calculated as the weight of moisture divided by dry weight of the soil, expressed as a percentage. This test was conducted according to ASTM D 2216. Moisture content is a useful index of a soil's compressibility. If the soil is to be used as fill, the moisture content may be compared to the range of water content for which proper compaction may be achieved. The moisture content results are indicated on the boring logs attached.

### Soil Compaction (Standard Proctor Test)

This test determines the maximum dry density that could be achieved by using uniform compaction effort at varying moisture contents. Two primary methods of compaction are used. For standard Proctor, 5.5-lb. rammer is dropped 12 inches and for modified Proctor, 10-lb. rammer is dropped 18 inches for compaction on the bulk sample in the cylindrical mold. Compaction is done in 3 and 5 equal layers respectively. The methods are explained in ASTM D 698 and ASTM D 1557, respectively. Our laboratory Standard Proctor tests indicate that maximum dry density is about 90.1 pcf can be achieved at varying optimum moisture contents. The results of the Standard Proctor tests are shown on the Attached Standard Proctor Test plot in the Appendix.

# IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, thanks to the Association of Soil and Foundation Engineers (ASFE).

When ASFE was founded in 1969, subsurface problems were frequently being resolved through lawsuits. In fact, the situation had grown to such alarming proportions that consulting geotechnical engineers had the worst professional liability record of all design professionals. By 1980, ASFE-member consulting soil and foundation engineers had the best professional liability record. This dramatic turn-about can be attributed directly to client acceptance of problem-solving programs and materials developed by ASFE for its members' application. This acceptance was gained because clients perceived the ASFE approach to be in their own best interests. Disputes benefit only those who earn their living from others' disagreements.

The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project.

## A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include: the general nature of the structure involved, its size and configuration; the location of the structure on the site and its orientation; physical concomitants such as access roads, parking lots, and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of his report may affect his recommendations.

Unless your consulting geotechnical engineer indicates otherwise, your geotechnical engineering report should not be used:

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership, or
- for application to an adjacent site.

*A geotechnical engineer cannot accept responsibility for problems which may develop if he is not consulted after factors considered in his report's development have changed.*

## MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by the geotechnical engineer who then renders an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those opined to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. For example, the actual interface between materials may be far more gradual or abrupt than the report indicates, and actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact.* For this reason, most experienced owners retain their geotechnical consultant through the construction stage, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

## SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly-changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

## A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and to review the adequacy



## SECTION 02 100 TEMPORARY SEDIMENTATION & EROSION CONTROL

### 1.00 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to work of this section.

#### 1.02 DESCRIPTION OF WORK

- A. The extent of temporary sedimentation and erosion control work is shown on the Drawings by schedules and details. However, additional measures may be required by local inspectors having authority to enforce such matters.
- B. It is specifically intended that temporary sedimentation and erosion control measures be installed prior to beginning land disturbing activities and be maintained throughout the construction period until all ground surfaces and drainage channels have become stabilized by a growing, viable ground cover, or other means so indicated on the Drawings as being final construction.
- C. No specific payment will be made for the installation and maintenance of sedimentation and erosion control devices unless scheduled on the Bid Form. NO PERIODIC PAYMENT FOR ANY WORK ITEM WILL BE RECOMMENDED UNLESS ALL REQUIRED SEDIMENTATION AND EROSION CONTROL DEVICES ARE IN-PLACE AND EFFECTIVELY MAINTAINED TO THE SATISFACTION OF THE ARCHITECT AND LOCAL AUTHORITIES.
- D. Related work specified elsewhere:  
  
Permanent Ground Cover, Section 02480.

#### 1.03 JOB CONDITIONS

- A. Do not begin any land disturbing activities until sedimentation and erosion control devices are in place.
- B. Furnish all materials, equipment and tools to install and maintain sedimentation and erosion control devices throughout the construction period.
- C. Install temporary grassing materials as erosion control material in accordance with schedule shown on the Drawings or as appropriate to the season or job conditions following the Engineer's approval of deviations from specified requirements.

### 2.00 PRODUCTS

#### 2.01 SILT FENCING - TYPE A

- A. Posts: Wood 3 in. diameter or nominal 2 in. x 4 in. by min. 5 ft. long. Steel round, U.T. or C shape at min. 1.3 lbs./ft. by min. 5 ft. long with projections for fastening fence wire.
- B. Woven Wire Fence: Min. 32 inches high with 6 horizontal wires and 12 inch spacing for vertical wires. Top and bottom wire min. 10 ga. all other min. 12.5 ga.
- C. Filter fabric: Synthetic rot-proof woven or nonwoven fiber meeting the following requirement:  
  
Tensile strength, ASTM D1682 Grab Test, 100 lb. min.  
  
Grab Elongation, ASTM D1682 Grab Test, 30% +/- 10%.  
  
Equivalent Opening Size, Corps of Engineers Guide Spec.

CW 02215, 100 sieve min., 40 sieve max.

Ultraviolet Stability, ASTM D1682, 80 lb. min.

Bursting Strength, ASTM D751 Diaphragm Bursting Tester, 175 lb. min.

Minimum Width 36 inches.

2.02 TEMPORARY SILT FENCE - TYPE B

- A. Posts and Filter Fabric same as Type A except:  
Posts, wood 2 in. diameter or nominal 2 in. x 2 in. by min. 3 ft. long. Steel round min. 1 in. in diam., other shapes min. 0.75 lbs./ft. by 3 ft. long.
- B. Fabric, min. width 22 in.

2.03 TEMPORARY SILT FENCE – TYPE C

- A. Posts: Steel posts, minimum 4 ft. length, size to be 1.3 lb./ft. minimum.
- B. Filter fabric same as Type A, 36 in. width.
- C. Space support posts at 4 ft. O.C. Provide woven wire fence backing.

2.04 RIP-RAP & STONE

- A. General: Use stone material, clean and free of rock dust and fines with not more than 10% of total weight passing a 5 in. sieve. Upgraded crusher-run surge stone not permitted.
- B. Rip-Rap Type 1, Heavy Duty: Largest pieces of 2 cubic feet volume, at least 35% of mass comprised of pieces weighing at least 125 lbs.
- C. Rip-Rap Type 2, General Duty: Largest pieces of 1 cubic foot volume, at least 35% of mass comprised of pieces weighing at least 15 lbs.
- D. Filter Bedding Stone: Ga. D.O.T. No. 3 nominal size, 1 " to 2 1/2" max.

2.05 MULCH

- A. Grain straw, grass hay, pine needles, shredded wood waste.

3.00 EXECUTION

3.01 SILT FENCE INSTALLATION

- A. Prior to beginning any land disturbing activity, install silt fencing as indicated on the project drawings.
- B. In areas of concentrated overland runoff, securely support silt fencing using a back-up fence supported on metal stakes at 6'0" centers driven approximately 18" into the ground. Use multiple rows of silt fencing to intercept heavy sediment loads as necessary to prevent sediment from migrating to undisturbed areas.
- C. Install the bottom 6" of silt fence into a trench cut into the undisturbed earth. Fill the trench, securing silt fence, with compacted soil or crushed stone as shown on the Drawings.
- D. Lap end section of silt fence 6'0.

3.02 HAY BALE INSTALLATION

- A. If shown on the Drawings, install hay bales as indicated. Butt hay bales securely against each other and secure in place to prevent flotation and movement.

3.03 SILT TRAP INSTALLATION

- A. Stake-out each silt trap at locations shown on the Drawings and to verify outlet elevation and assure obtaining required retention volume.
- B. Excavate silt trap to required volume. Grade and compact excavated material around the pond to uniform surfaces so as to prevent areas of concentrated water flow.
- C. Install standpipe or outlet control services as shown on the Drawings noting and complying with pipe size, elevation and outlet protection requirements. Thoroughly compact backfill around standpipe and outlet.
- D. Place stone around standpipe and rip rap at discharge in the quantity/configuration noted on the Drawings.
- E. Grass and mulch grade surfaces around the silt trap.

3.04 GROUND COVER

- A. Protect all exposed earth slopes with an application of temporary grass, hay mulch, jute mats or other material that effectively prevents erosion.

3.05 MAINTENANCE

- A. Maintain silt fencing by removing accumulated silt, resealing stakes, and repairing failed sections. Re-erect silt fence disturbed by construction activities. Install additional silt fence if needed due to severe conditions.
- B. Excavate silt from trap areas that have become full. Dispose of silt to prevent it from immediately reentering the trap. Replace stone around the standpipe that has become silt saturated. Secure outlet rip rap, regrass, replace ground cover disturbed by maintenance operations.
- C. Regrass and replace mulching throughout the construction period to the extent needed to minimize erosion.

3.06 CLEAN-UP

- A. At the time construction is complete and permanent ground cover is established, remove all temporary sedimentation and erosion control devices.
- B. Dispose of accumulated silt in a manner compatible with completed construction.
- C. Fine grade all ground surfaces and plant permanent vegetation as required by the contract documents.
- D. Dispose of all silt fence, standpipe and rip-rap materials in a legally acceptable manner. DO NOT BURY ON SITE.

END OF SECTION



---

**SECTION 02 105 DEMOLITION**

1.00 - GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions apply to work of this section.

1.02 DESCRIPTION OF WORK

The extent of demolition work is shown on the Drawings.

1.03 QUALITY CRITERIA

- A. Comply with applicable codes regulating demolition work at the project site.
- B. Prior to beginning demolition operations notify owners of utility services to assure utilities serving the site have been properly disconnected and locations flagged.

1.04 EXAMINATIONS OF SITE

- A. Visit the site and carefully examine work to be demolished so as to become familiar with existing conditions, the nature and scope of the work and difficulties that attend its execution prior to submitting proposals.
- B. Submission of a proposal will be construed as evidence that such an examination has been made, and later claims for labor, equipment or materials required or for difficulties encountered, which could have been foreseen had such an examination been made, will not be recognized.

1.05 TITLE TO STRUCTURES

- A. Upon CONTRACTOR'S receipt of Notice to Proceed with the Work on all or any part of the premises, all right, title, and interest of the OWNER in and to buildings, and other property to be demolished and removed by the CONTRACTOR, on said part or all of the premises described in such Notice, shall be deemed to be vested in the CONTRACTOR, subject to any provisions of the Contract Documents.
- B. No right, title, property, or interest of any kind whatsoever in land or premises upon which such buildings and structures stand, is created, assigned, conveyed, granted or transferred to the CONTRACTOR, or any other persons, except only the license and right of entry to remove such buildings and structures in strict accordance with the Contract Documents.
- C. Property belonging to the public service companies, unless abandoned by such companies, shall not become the property of the CONTRACTOR by reason of transfer provided for, and the OWNER does not warrant title to any such property.
- D. Hidden valuable items, buried items or personal property of third persons or occupants of buildings that are to be demolished shall not become property of the CONTRACTOR.
- E. Salvage, store and protect the following items:
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  -

All other items to be removed from the existing steel frame structures, including lavatory enclosure structure, will become property of the CONTRACTOR.

- F. If OWNER terminates CONTRACTOR'S right to proceed, all right and title in and to buildings, structures, material and property hereby transferred to CONTRACTOR shall revert to and vest in OWNER without prejudice to any claim which OWNER may have against CONTRACTOR arising from CONTRACTOR'S default.

**1.06 RISK OF LOSS**

- A. CONTRACTOR shall accept site as he finds it and shall inform himself of its character and type of structures to be removed. OWNER assumes no responsibility for condition of buildings and structures on premises. Damage or loss (whether by reason of fire, theft or other happenings) shall be at the risk of CONTRACTOR from time he enters the premises for purpose of protecting the property, or from and including the day following receipt of Notice to Proceed, whichever is earlier, and no such damage or loss to buildings or structures shall relieve CONTRACTOR from any obligation under the Contract.
- B. CONTRACTOR shall have immediate right of entry to the premises from and including the day following receipt of Notice to Proceed; and, in any event within two days (exclusive of Saturdays and Sundays) after receipt of Notice to Proceed, CONTRACTOR and a representative of OWNER shall inspect premises. Any claim by CONTRACTOR that property has been damaged, lost or destroyed from date of opening of bids must be made in writing to OWNER within three (3) days from date of such inspection. Any dispute concerning questions of fact shall be resolved as provided in Contract Documents for settlement of disputes.

**2.00 - MATERIALS**

Not applicable to this section.

**3.00 - EXECUTION**

**3.01 PROTECTION**

- A. Provide and erect all temporary planking, bridges, fences, bracing, shoring, sheet piling, lights and warning signs required by jurisdictional authorities, applicable codes, and site conditions, for the protection of persons, streets, and adjacent on-site and off-site property.
- B. Fully protect all trees, shrubs, and other plantings on site or adjacent street, and adjacent property during all demolition operations. Use wood enclosures and heavy padded burlap wrappings for such protection. Full responsibility for repairs to and replacement of damaged plantings rests with CONTRACTOR. Repairs and replacements shall be as approved by the ARCHITECT.
- C. Leave all protection in place and maintain until demolition work has been completed and all danger of damage has passed. Protection shall be removed only after approval is given by the ARCHITECT.

**3.02 ASBESTOS-CONTAINING MATERIAL**

- A. Stop work immediately, if at any time during demolition any work is encountered which might contain asbestos as a matter of common knowledge such as:
- Pipe, boiler or roof thermal insulation
  - Roof and ceiling tile, Acoustical plaster
  - Transite pipe or transite materials

- B. Do not proceed to remove asbestos-containing materials without the written authorization of the ARCHITECT, and in all cases, such work must be in compliance with Federal, State and local requirements.

3.03 EXISTING UTILITIES

- A. Notify in writing all utility and telephone service companies before starting work. Make arrangements for the removal of all equipment from buildings, and for the capping of pipes and wiring. Ascertain that all water, gas, sewers, electric services, etc. have been disconnected and capped before starting any demolition work.

3.03 DEMOLITION

- A. Use of Explosives in execution of demolition work is prohibited under any conditions.
- B. Load all debris and materials within confines of existing open spaces on site. Loading in streets surrounding site is prohibited. Trucks, or other equipment, shall not interfere with traffic on surrounding thoroughfares. Immediately remove any debris or materials that may accidentally fall onto streets or walks surrounding site.
- C. Maintain constant dust control during all operations. Wet down walls and other structure parts prior to and during demolition. Wet down materials on trucks prior to leaving premises.
- D. For structures with concrete ground level floors, remove entire structure to ground level, and remove concrete slabs on ground.

3.04 CLEAN UP

- A. At completion of each day's work, clean surrounding streets and walks of any accumulation of debris, materials, dirt, etc. resultant from demolition operations. Do not allow debris, salvage materials, etc. to accumulate on site. Remove from site as rapidly as possible. At completion of all demolition operations prior to final payment, all debris, salvage materials etc. must be completely removed from the premises.

END OF SECTION



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## SECTION 02 110 SITE CLEARING

### 1.00 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, and Supplementary Conditions apply to work of this section.

#### 1.02 DESCRIPTION OF WORK

- A. Extent of site clearing is shown on drawings.
- B. Site clearing work includes, but is not limited to:
  - 1. Removal of trees and other vegetation.
  - 2. Clearing and grubbing.
  - 3. Removing above-grade improvements.

#### 1.03 JOB CONDITIONS

- A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.
- B. Protection of Existing Improvements: Provide protection necessary to prevent damage to existing improvements indicated to remain in place.

### 2.00 PRODUCTS

Not applicable to work of this section.

### 3.00 EXECUTION

#### 3.01 SITE CLEARING

- A. General: Remove trees, shrubs, grass and other vegetation, improvements, or obstructions interfering with installation of new construction. Remove such items elsewhere on site or premises specifically indicated. Removal includes digging out stumps and roots.
- B. Clearing and Grubbing: Clear site of trees, shrubs and other vegetation, except for those indicated to be left standing.
  - 1. Completely remove stumps, roots, and other debris protruding through ground surface.
  - 2. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

- C. Removal of Improvements: Remove existing above-grade and below-grade improvements necessary to permit construction, and other work as indicated.

3.02 DISPOSAL OF WASTE MATERIALS

- A. Burning on OWNER'S Property: Burning is not permitted on OWNER'S property.
- B. Removal from Project Site: Remove waste materials and unsuitable and excess topsoil from project site and dispose of off site in legal manner.

END OF SECTION

## SECTION 02 200 EARTHWORK

### 1.00 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to work of this section.

#### 1.02 DESCRIPTION

- A. This Section and related drawings describe requirements pertaining to earthwork.

#### 1.03 SITE INFORMATION

- A. The data on indicated subsurface conditions are not intended as representations or warranties of the continuity of such conditions. It is expressly understood that the OWNER will not be responsible for interpretations or conclusions drawn there from by the CONTRACTOR.
- B. Additional soil investigations may be made by the CONTRACTOR at no cost to the OWNER, provided such operations are acceptable and approved in writing by the ARCHITECT.

#### 1.04 SOIL QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. The OWNER will retain the services of a soils consultant to test for compliance with these specifications. When fill or backfill is required to be compacted to any specified density, the ARCHITECT may order such fill or backfill to be laboratory tested in order to ascertain compliance with specification requirements. Tests will be executed immediately prior to covering of such compacted areas.

#### 1.05 UNCLASSIFIED EXCAVATION

- A. Section is omitted.

#### 1.06 REMOVAL OF EXISTING UNDERGROUND UTILITIES

- A. Demolish and completely remove from the site all existing underground utilities indicated to be removed. Coordinate with local utility companies for verification or shut-off of services if lines are active.

#### 1.07 COMPACTION EQUIPMENT

- A. Provide compaction equipment to complete the work on schedule.
- B. Use sheepsfoot rollers, pneumatic tired rollers, tamper rollers, vibrating tampers, or other compaction equipment to obtain the required density throughout the entire layer being compacted.

### 2.00 PRODUCTS

#### 2.01 SATISFACTORY SOIL MATERIALS

- A. Satisfactory soil materials are defined as those complying with the American Association of State Highway Officials (AASHO) Designation M145, soil classification Groups A-1, A-2-4, A-2-5, and A-3. At time of compaction, soil material shall have a moisture content of 3%+/- of the optimum moisture content as determined by ASTM D698 or D1557.

#### 2.02 UNSATISFACTORY SOIL MATERIALS

- A. Unsatisfactory soil materials are defined as those described in AASHO M145, soil classification Groups A-2-6, 2-7, A-4, A-5, and A-6, and A-7; also, peat and other highly organic soils; and soil materials of any

classification that have a moisture content other than specified for satisfactory materials. A-5 and A-6 soils may be used on a case-by-case basis at the approval of Soils Consultant. Use of these soils must be as dictated by Soils Consultant.

2.03 COHESIONLESS SOIL MATERIALS

- A. Cohesionless soil materials include gravels, sand-gravel mixtures, sands and gravelly-sands.

2.04 COHESIVE SOIL MATERIALS

- A. Cohesive soil materials include clayey and silty gravels, sand-clay mixtures, gravel-silt, mixtures, clayey and silty sands, sand-silt mixtures, clays, silts, and very fine sands.

2.05 ROCK

- A. Rock excavation consists of the removal and disposal of materials encountered that cannot be excavated without continuous and systematic drilling and blasting or continuous use of a single tooth ripper having a draw-bar pull no less than 56,000 lbs. a front end loader having a minimum bucket break out force of 25,600 lbs., or a backhoe having a bucket curling force rated at not less than 33,000 lbs. or other special equipment, except such materials that are classified as earth excavation. Typical of the materials classified as rock are boulders 1.0 cu. yd. or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits.

2.06 FILL MATERIALS

- A. Excavated material that is suitable, as defined, may be used for fills and backfills. Provide any additional fill material from off the site as may be required to produce designated lines and grades of fills, backfills and rough grades. Fills brought from off the site shall conform to specifications for various uses as specified.
- B. Fill materials shall be approved and conform to the following requirements, except as specifically indicated otherwise:
1. Fill shall be earth, free of debris, cinders, combustibles, frost, ice, roots, sod, wood, cellulose, organic materials, and materials that may be fill material may be rock-like-materials not more than 0.50 cubic foot in volume nor more than 12 inches in length, if evenly distributed in the total fill.
  2. Top 18 inches of fills under topsoil of lawn and planted areas shall be earth, free of debris, cinders, frost, ice, sod, wood, and roots over 1/4 inch in diameter. Up to 10% of fill material may be rock-like materials not more than 0.15 cubic foot in volume nor more than 4 inches in length. Also, up to 20 percent of fill material may be topsoil, but no sod.
  3. Fill, within five feet from buildings and other structures, shall be soil free of debris, cinders, combustibles, frost, ice, roots, sod, wood, cellulose, and organic materials. Up to 40 percent of fill material may be rock-like materials not more than 3 inches in length.
  4. Porous fill for use below slabs on earth, if used, shall be approved gravel, crushed stone, or blast furnace slag, ranging between 1/4 to 3/4 inch in size.
  5. Slag, if used for porous fill, shall be the nonmetallic product, consisting essentially of silicates and alumina-silicates of lime and other bases, which is developed simultaneously with iron in a blast furnace. Material shall meet all requirements of ASTM C33 and not be adversely affected by soil or water.
  6. All fill to replace excess excavation under footings and foundations shall be minimum 2000 psi concrete meeting applicable requirements of Concrete Division of these Specifications.

**3.00 EXECUTION**

**3.01 GRADING**

- A. Grading consists of the removal and disposal of all materials encountered to obtain the required subgrade elevations.

**3.02 EXISTING UTILITIES**

- A. Locate existing underground utilities by careful hand excavation before starting earthwork operations. If utilities are to remain in place, provide protection from damage during construction operation.
- B. Should other utilities not shown be encountered during excavation, consult the ARCHITECT immediately for directions as to procedure. Cooperate with the OWNER, and public and private utility companies in keeping services and facilities in operation. Repair damaged utilities to the satisfaction of the utility owner.

**3.03 USE OF EXPLOSIVES**

- A. Do not bring explosives onto the site or use in the work without the prior written permission of the OWNER. The CONTRACTOR is solely responsible for the handling, storage, and use of explosive materials when their use is permitted.
- B. Perform blasting operations using skilled personnel, in compliance with governing regulations. Comply with ANSI A10.2 "Safety Code for Building Construction" for the minimum requirements for blasting.
- C. Store explosives, if permitted on OWNER'S property, only in proper storage structures. Keep storage facilities securely locked at all times except for inspection and for delivery and storage of explosives. Provide full time watchman and other controls as required by governing regulations.
- D. Conduct blasting operations using explosives of such quantity and power, and fired in such sequence and locations, as not to injure personnel or damage property, or damage adjacent work. Assume full responsibility for damages resulting from or attributable to blasting operations.

**3.04 SURFACE PREPARATION**

- A. Within designated construction areas (inside and outside of structures), remove earth, grass, weeds, and similar top coverings to depths indicated. Treat uncovered earth surfaces with approved grass, weed and similar growth-killing solution guaranteed to prevent return of plant growth where following conditions occur:
  - 1. Under new fill where concrete slabs occur over fill.
  - 2. Over cut areas where concrete slabs occur and depth of cut normally be less than 6 inches.
  - 3. Under areas to receive gravel surfacing.
- B. Break up any existing paving, masonry, and concrete, and remove from site, except as designated to remain.
- C. Where topsoil will be required on site for finish grading and planting work, strip existing topsoil to a minimum depth of 6 inches in areas of construction and cut areas of grading. Sift topsoil free of growth, debris, etc. and stockpile on site as directed. If size of site precludes on-site storage, make arrangements for use of an off-site area and stockpile topsoil there. Protect against theft, erosion and any accumulation of debris during construction operations. Do not strip topsoil when it is in muddy condition.

**3.05 TREES**

- A. Remove existing trees on site which are indicated to be removed. Before removal of any full-grown trees that are not specifically designated to be removed, consult with ARCHITECT and obtain permission and full instructions for removal or trimming.
- B. Stumps and their roots, that would, if not removed, remain within an area of five feet beyond the confines of exterior structure walls, shall be removed in their entirety.
- C. Within designated construction area and outside of exterior walls of structures, remove all stumps, roots and other debris to a minimum depth of 2 feet below new subgrades of lawns and planting areas.
- D. Within designated construction areas and outside of exterior walls of structures, remove all stumps, roots and other debris to a minimum depth of 3 feet below new subgrades of walks and paved areas.
- E. Existing stumps and roots from previously felled trees shall be disposed of in same manner as for trees felled under conditions of this Contract.
- F. At CONTRACTOR'S option, remove all cut trees, shrubs, stumps, etc., from site or, when approved, burn on site in strict accordance with laws and regulations governing such action.
- G. When the site contains trees and shrubs that are not to be removed, protect all such trees and shrubs. Execute protection with wood enclosures and heavy, padded burlap wrappings. Remove protection when so directed; and in any event, remove at completion of construction work.

**3.06 GRADING AROUND TREES**

- A. Where excavating, filling or grading is required within branch spread of trees that are to remain, perform work as follows:
  - 1. When trenching occurs around trees that are to remain, the tree roots shall not be cut but the trench shall be tunneled under or around the roots by careful hand digging and without injury to the roots.
  - 2. When existing grade at tree is below new finished grade, and fill not exceeding 16 inches is required, place clean washed gravel graded from 1-inch to 2-inch size directly around the tree trunk. Gravel shall extend out from trunk on all sides a minimum of 18 inches and finish approximately 2-inches above finished grade at tree. Install gravel before any earth fill is placed. New earth fill shall not be left in contact with trunks of any trees requiring fill.
  - 3. Existing trees, in areas where new finished grade is to be lowered, shall have regrading work done by hand to elevation as indicated. Roots, as required, shall be cut cleanly 3-inches below finished grade, and have scars covered with tree paint.
- B. After completion of work, remove from premises any imported and excavated surplus materials. Remove from site all materials that are taken from excavations and that are unsuitable for use in fill and backfill work. Location of dump and length of haul shall be CONTRACTOR'S responsibility.

**3.07 PROOF ROLLING**

- A. Areas to receive fill material shall be proof rolled with rolling equipment weighing not less than 20 tons with not less than four pneumatic tired wheels inflated to at least 100 psi. All areas shall receive at least four consecutive passes of the equipment which shall be observed by a qualified geotechnical engineer retained by the OWNER. The proof rolling will locate soft zones which may need to be undercut and will densify the upper layers of the soil to receive the fill.

**3.08 COMPACTION REQUIREMENTS**

- A. Unless otherwise recommended by Soils Reports prepared by qualified geotechnical engineers, place fill in 8 inch layers, loose measure, and compact to the following Standard Proctor densities, ASTM D-698, at optimal moisture content:

Below building foundations and floor slabs:	95%
Below streets and in public right-of-way:	95%
Below sidewalks and parking pavements:	95%
Below foundations, floor slabs, streets, parking and driveways, top 1.0 foot:	100%
Below grassed and landscaped areas:	90%
Below natural terrain:	85%

3.09 DISPOSAL OF WASTE MATERIALS

- A. Removal from Project Site: Remove materials unsuitable for backfilling from the project site and dispose of in a legally acceptable manner.

3.10 GRADING

- A. Earth excavation consists of the removal and disposal of pavements and other obstructions visible on the ground surface, underground structures and utilities indicated to be demolished and removed, material of any classification indicated in the data on subsurface condition, and all other materials encountered that are not classified as rock excavation or unauthorized excavation.
- B. Rock excavation consists of the removal and disposal of materials described in paragraph 2.05.
- C. Provide temporary ditches, pumps, etc. as required to maintain cut and fill areas dry. Maintain until no longer required, and then backfill to required new or original grades. Immediately prior to placing of other work, recheck base, fill voids and if necessary re-roll to required density and compaction.
- D. Excavate cut areas within confines of site to required grades, levels, contours, and to sufficient depth necessary to obtain satisfactory proof rolling.
- E. Proof roll all undercut and parking/driveway areas in accordance with paragraph 3.07, following.
- F. Further undercut soils below building foundations and parking areas until encountered soils do not yield excessively when proof rolling, as verified by a qualified geotechnical engineer.
- G. The subgrade for lawn and planting areas shall be not less than 4 inches below final finish grade.
- H. The subgrade for paved areas shall be finished to elevations required to allow for sub-base and finished paving which will be executed under another Section of these Specifications.
- I. Grading, including excavated and filled sections and adjacent transition areas, shall be reasonably smooth, compacted and free from irregular surface changes. Degree of finish shall be that ordinarily obtainable from either blade-grader or scraper operations, except as otherwise specified. Tolerance for areas within 10 feet of buildings and all areas to be paved, shall not exceed 0.20 feet above or below established subgrade. All ditches, swales and gutters shall be finished to drain readily. Unless otherwise indicated on drawings, subgrade shall be evenly sloped to provide drainage away from building walls in all directions at a grade not less than 1/4 inch per foot. Provide roundings at top and bottom of banks and at other breaks in grade.
- J. Redress and recompact any areas that settle below required grades because of traffic, precipitation, or storage loading before execution of other work required.
- K. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations not required by the Contract Documents. Replace unauthorized excavation as herein specified.
- L. Backfill and compact unauthorized excavations as specified for authorized excavations of the same classification.

3.11 DEWATERING

- A. Perform earthwork and site grading in manner to prevent surface water and subsurface or ground water from flowing into excavations, and to prevent water from flooding the project site and surrounding area.
- B. Do not allow water to accumulate in excavations. Remove all water from excavations using dewatering methods which will prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to the stability of subgrades and foundations. Provide and maintain pumps, sumps, suction and discharge lines, and other dewatering system components necessary to convey the water away from the site.
- C. Convey water removed from excavations and rain water to collecting or run-off areas. Provide and maintain temporary drainage ditches and other diversions. Do not use trench excavations for site utilities as temporary drainage ditches.
- D. Maintain dewatering system until work in excavations is complete.

3.12 EXCAVATION FOR PAVEMENTS

- A. Perform excavation under pavement areas to comply with the cross-sections, elevations and grades as shown on the drawings.
- B. For all paving to be placed over cut areas, excavate to required depths. Trim cuts accurately to provide for minimum design thickness of slabs.

3.13 EXCAVATION FOR DITCHES

- A. Cut ditches to the cross-sections and grades as shown on the drawings. Deposit excavated materials a sufficient distance from the edge of ditches to prevent cave-ins or material falling or sliding into the ditch. Keep ditches free of an accumulation of leaves, sticks, and other debris until final acceptance of the work.

3.14 EXCAVATION FOR AREAS OUTSIDE CONFINES OF PAVEMENTS AND STRUCTURES

- A. For all cut areas outside pavements and building, excavate to required levels, grades and contours.

3.15 REMOVAL OF UNSATISFACTORY SOIL MATERIALS

- A. Excavate unsatisfactory soil materials, as defined by paragraph 2.02, that extend below the required elevations, to the additional depth until satisfactory material is encountered. Satisfactory and unsatisfactory soil materials shall be as determined by the soils laboratory.
- B. Payment for such additional excavation, provided it is not due to the fault or neglect of the CONTRACTOR, will be made under the provisions of the Contract for Changes in the Work.
- C. Where the removal of unsatisfactory soil materials is due to the fault or negligence of the CONTRACTOR in his performance of earthwork and site grading operations, excavate the resulting unsatisfactory soil material and replace with compacted satisfactory soil material as required.

3.16 MOISTURE CONTROL

- A. Provide sufficient equipment capable of adding measured amounts of moisture to the soil material as determined by moisture-density relation tests. Maintain the actual moisture content in the soil material at the time of compaction to within the limits specified for satisfactory soil materials.

- B. Where the subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply the required amount of water to the surface of subgrade, or layer of soil material, in such a manner as to prevent free water appearing on the surface during or subsequent to compaction operations.
- C. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified percentage of maximum density.
- D. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread on the surface where directed and permitted to dry. Assist drying by discing, harrowing or pulverizing, until the moisture content is reduced to a satisfactory value, as determined by moisture-density relation tests. When accepted by the soils laboratory, the soil material may be used in compacted backfill or fill.

**3.17 EXCAVATION FOR FOUNDATIONS**

- A. In event bearing capacity at levels indicated are found insufficient, ARCHITECT may order excavations carried to levels necessary to obtain proper bearings, in which case the contract sum will be adjusted accordingly.
- B. Should proper bearing capacity be found to exist at less depths than indicated, ARCHITECT may order omission of excavations beyond such points, in which case the contract sum will be adjusted accordingly.
- C. Take proper care not to excavate beyond depths required. No backfilling will be permitted under any footings. In event excavations are carried below required depths without authorization, fill such excess excavations with concrete. This concrete shall be brought to required or indicated levels without additional expense to OWNER.
- D. For all concrete slabs to be placed over cut areas, excavate to required depths. Trim cuts accurately to provide for minimum design thickness of slabs.
- E. If ground water is discovered to exist above the bottom of the lowest floor slab the CONTRACTOR shall notify the ARCHITECT who will determine if the underground structure and drainage as designed are adequate. If the ARCHITECT deems it necessary to revise the scope of the work, such revision will constitute the basis for a negotiated change in the Contract Price.
- F. Install porous fill base course directly below all concrete floor slabs on earth. After placing and leveling of aggregate, add sufficient coarse sand to fill voids between coarse aggregate when compacted.

Roll and tamp until top surface of porous fill base course is absolutely true to line and grade after compaction and prior to concrete pour. Trim top surfaces to permit minimum design thickness of concrete cover. After compaction and prior to pouring of concrete, cover porous fill with one layer of heavy-duty, minimum 6 mil thick, polyethylene film with all joints lapped 4 inches. Minimum thickness of compacted porous fill shall be noted on drawings; or, if not so noted, install to minimum compacted thickness of 4 inches.

**3.18 BACKFILLING**

- A. Do not start backfilling until all other work in conjunction therewith has been completed, inspected, approved, and authorized by the ARCHITECT.
- B. Before starting backfill work, remove debris, wood and other foreign matter from excavations.
- C. When temporary sheeting, shoring or bracing is removed, fill remaining voids with backfill material and compact to required density.

- D. Execute backfill to required levels, grades and contours with the same compaction requirements specified for the area.
- E. Redress and recompact any areas that settle below required grades before execution of the work required and leave solid and secure against future settlement.
- F. Do not place backfill against concrete construction until 28 day compressive strength has been reached and completion of structure is sufficient to accommodate lateral earth loads.

3.19 TESTING

- A. Provide written documentation to the OWNER prepared by a Georgia licensed Engineer to assure compaction densities meet or exceed requirements of this specification.
- B. Conduct compaction/density testing as follows:
  - 1. Building slab fill: One test per 1,000 sq. feet of area per foot of fill depth.
  - 2. Building Footings: One test per 250 linear feet of building footing (turn-down slabs not included).
  - 3. Driveways and parking area: One test per 2,000 sq. feet of area per foot of fill depth.

END OF SECTION

## SECTION 02 210 TRENCHING AND BACKFILLING

### 1.00 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to work of this section.

#### 1.02 DESCRIPTION

- A. This section and related drawings describe requirements pertaining to earthwork.
- B. Trenching and Backfilling includes:
- Dewatering excavation
  - Excavating all materials
  - Handling and disposal of unsuitable material
  - Backfilling and compacting
- C. Trenching and Backfilling does not include:
- Shoring and bracing excavation
- D. Perform trenching and backfilling within rights of way of state, municipal, public utility or other governmental agencies in accordance with requirements of those respective agencies. Such requirements shall take precedence and supersede provisions of these specifications.

#### 1.03 SITE INFORMATION

- A. Any data on indicated subsurface conditions are not intended as representations or warranties of the continuity of such conditions. It is expressly understood that the OWNER will not be responsible for interpretations or conclusions drawn there from by the CONTRACTOR.
- B. Soil investigations may be made by the CONTRACTOR at no cost to the OWNER, provided such operations are acceptable and approved in writing by the ARCHITECT.

#### 1.04 SOIL QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. The OWNER will retain the services of a soils consultant to test for compliance with these specifications. When fill or backfill is required to be compacted to any specified density, the ARCHITECT may order such fill or backfill to be laboratory tested in order to ascertain compliance with specification requirements. Tests will be executed immediately prior to covering of such compacted areas.

#### 1.05 REMOVAL OF EXISTING UNDERGROUND UTILITIES

- A. Demolish and completely remove from the site all existing underground utilities indicated to be removed. Coordinate with local utility companies for verification or shut-off of services if lines are active.

#### 1.06 SAFETY STANDARDS

- A. Conduct excavation operations to meet requirements of OSHA Construction Standards, Part. 1926, Subpart P, "Excavation, Trenching and Shoring", and Subpart O. "Motor Vehicles, Mechanized Equipment, and Marine Operations". Where local excavation safety standards are more stringent than OSHA Standards, the local standards shall take precedence.

- B. Place safety and traffic barriers at all construction areas to warn vehicles traffic and pedestrians of such excavation. Provide lighted barricades, flagmen, and other public safety procedures as required by authorities having jurisdiction.

**2.00 PRODUCTS**

**2.01 SATISFACTORY SOIL MATERIALS**

- A. Satisfactory soil materials are defined as those complying with the American Association of State Highway Officials (AASHTO) Designation M145, soil classification Groups A-1, A-2-4, A-2-5, and A-3. At time of compaction of 3%+ of the optimum moisture content as determined by ASTM D698 or D1557.

**2.02 UNSATISFACTORY SOIL MATERIALS**

- A. Unsatisfactory soil materials are defined as those described in AASH) M145, soil classification Groups A-2-6, 2-7, A-4, A-5 and A-6, and A-7; also, peat and other highly organic soils; and soil materials of any classification that have a moisture content other than specified for satisfactory materials. A-5 and A-6 soils may be used on a case-by-case basis at the approval of the Soils Consultant.

**2.03 COHESIONLESS SOIL MATERIALS**

- A. Cohesionless soil materials include gravels, sand-gravel mixtures and sands gravelly-sands.

**2.04 COHESIVE SOIL MATERIALS**

- A. Cohesive soil materials include clayey and silty gravels, sand-clay mixtures, gravel-silt, mixtures, clayey and silty sands, sand-silt mixtures, clays, silts, and very fine sands.

**2.05 ROCK**

- A. Rock excavation consists of the removal and disposal of materials encountered that cannot be excavated without continuous and systematic drilling and blasting or continuous use of a single tooth ripper having a draw-bar pull no less than 56,000 lbs. a front end loader having a minimum bucket break-out force of 25,600 lbs. or a backhoe having a bucket curling force rated at not less than 33,000 lbs. or other special equipment, except such materials that are classified as earth excavation. Typical of the materials classified as rock are boulders 1.0 cu. yd. or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits.

**2.06 FILL MATERIALS**

- A. Excavated material that is suitable, as defined, may be used for fills and backfills. Provide any additional fill materials from off the site as may be required to produce designated lines and grades indicated by the project Drawings.
- B. Fill materials shall be approved and conform to the following requirements, except as specifically indicated otherwise:
  - 1. Fill shall be earth, free of debris, cinders, combustibles, frost, ice, roots, sod, wood, cellulose, organic materials, fill may contain rock-like-materials not more than 0.50 cubic foot in volume nor more than 12 inches in length, if evenly distributed in the total fill.
  - 2. Top 18 inches of fills under topsoil of lawn and planted areas shall be earth, free of debris, cinders, frost ice, sod, wood and roots over 1/4 inch in diameter. Up to 10% of fill material may be rock-like materials not more than 0.15 cubic foot in volume nor more than 4 inches in length. Also, up to 20 percent of fill material may be topsoil, but no sod.

3. Fill, within two feet of pipe and other structures, shall be soil free of debris, cinders, combustibles, frost, ice, roots, sod wood, cellulose, and organic materials. Up to 40% of fill material may be rock-like material not more than 3 inches in length.

### 3.00 EXECUTION

#### 3.01 EXISTING UTILITIES

- A. Locate existing underground utilities by careful hand excavation before starting earthwork operations. If utilities are to remain in place, provide protection from damage during construction operation.
- B. Should other utilities not shown be encountered during excavation, consult the ARCHITECT immediately for directions as to procedure. Cooperate with the OWNERS, and public and private utility companies in keeping services and facilities in operation. Repair damaged utilities to the satisfaction of the utility OWNER.

#### 3.02 USE OF EXPLOSIVES

- A. Do not bring explosives onto the site or use in the work without the prior written permission of the OWNER. The CONTRACTOR is solely responsible for the handling, storage, and use of explosive materials when their use is permitted.
- B. Perform blasting operations using skilled personnel, in compliance with governing regulations. Comply with ANSI A10.2 "Safety Code for Building Construction" for the minimum requirements for blasting.
- C. Store explosives, if permitted on OWNER'S property, only in proper storage structures. Keep storage facilities securely locked at all times except for inspection and for delivery and storage of explosives. Provide fulltime watchman and other controls as required by governing regulations.
- D. Conduct blasting operations using explosives of such quantity and power, and fired in such sequence and locations, as not to injure personnel or damage property, or damage adjacent work. Assume full responsibility for damages resulting from or attributable to blasting operations.

#### 3.03 SURFACE PREPARATION

- A. Within designated construction areas, remove those improvements as necessary for trenching.
- B. Where trenching is to pass through streets, curbs, and other paved areas, saw-cut neat lines in the paving or curbing prior to excavation.
- C. Remove existing trees on site which are indicated to be removed. Before removal of any full-grown trees that are not specifically designated to be removed, consult with ARCHITECT and obtain permission and full instructions for removal or trimming.
- D. Stumps and their roots, that would, if not removed, remain within an area of five feet beyond the confines of exterior structure walls, shall be removed in their entirety.

#### 3.04 TRENCH EXCAVATION

- A. Excavate all materials necessary for construction including structures and appurtenances at the elevations, grades and alignments as shown on the Drawings.
- B. Cut trench banks that are vertical and parallel equidistant from the proposed pipe centerline to a distance 12 inches above the pipe crown and at widths not greater than shown on the Drawings. Where sheeting is used, install so that distance between sheeting surfaces will not exceed maximum allowable trench widths.

- C. Cut trench bottom carefully allowing for installation of valves, thrust blocking, pipe bells and other appurtenances. Excavate for pipe, manholes and appurtenances no more than ten joints ahead of installation operations. Fine grade trench bottom so that no part of any pipe joint, coupling or other fitting is in contact with the trench bottom when pipes are joined.
- D. Do not excavate more than 400 feet ahead of pipe installation operations.
- E. Where trenches are excavated below elevations shown on the Drawings, fill over-excavated area with suitable fill, compacted to 95% Standard Proctor Density at the optimum moisture content, crushed stone or sand in order to obtain required pipe elevations and grades. Payment for over excavation due to existing poor pipe bedding condition will be paid for as authorized and following preparation of a Change Order.
- F. Place excavated materials along open trenches in a manner so that no damage occurs outside the construction right-of-way.
- G. Control rainfall runoff by placing sediment barriers as shown on the Drawings, or as directed by the OWNER'S representatives, and in a manner meeting the requirements of governmental agencies having jurisdiction.
- H. Where rock is encountered over-excavate for the full bottom trench width to the following depths:

Backfill over-excavated areas as described in E, above.

Pipe Diameter (Inches)	Over-excavation Depth (Inches)
8 to 18	8
18 to 30	10
32 and greater	12

3.05 DEWATERING

- A. Do not permit water to accumulate in trench bottoms. Use pumps, well points and other appropriate means to keep trench bottoms, and foundations for pipeline appurtenances free of water. Do not permit trench bottoms to be used as a channel to convey water.
- B. Do not permit pipe installation in trenches containing standing or running water, or on trench bottoms that have been soaked by water.
- C. Where trench bottoms have been, in the opinion of the Owner's representative, weakened by water, over excavate and backfill as described in 3.04 - E, above.

3.06 SHORING AND BRACING

- A. Install shoring and bracing as necessary to provide safe working conditions and meet the requirements of authorities having jurisdiction.
- B. Design and install shoring and bracing having sufficient strength and rigidity to withstand all soil and other loadings caused by surcharging and adjacent traffic.
- C. Shore and brace excavation next to structures and through pavements to prevent settlement. Repair at no expense to the OWNER, any damage claimed due to faulty shoring and bracing.
- D. Unless otherwise authorized, remove all shoring and bracing prior to backfilling. Shoring and bracing may be left in place if authorized, and in a manner recommended by the ARCHITECT.

3.07 BACKFILLING

- A. Begin backfilling immediately following installation of the pipeline and inspection. Use a satisfactory soil material or a cohesionless soil material. Place backfill in the trench in 6 inch depth layers for the full trench width and uniformly compact to specified density. Backfill from above the class of bedding indicated on the Drawings and compact to provide a minimum 12-inch cover over the pipe. Install backfill to prevent lateral displacement of the pipe. Use special care when backfilling flexible pipes to prevent deformation of the pipe.
- B. Within street, alleys and driveways subject to vehicle loads continue compaction in 6-inch layers for full trench depth to within 6 inches of final backfill elevation. Use a crushed stone for the final 6 inches of fill.
- C. Within areas not affected by vehicular traffic, place fill for full trench depth in 12-inch layers, each compacted to specified requirements. At finished grade elevation, leave backfill neatly rounded over trench at a sufficient height to allow for trench settlement.
- D. Backfill around pipeline structures in 6 inch depth layers and compact to achieve required degree of compaction. Do not place backfill against concrete construction until 28 day compressive strength has been reached and completion of structure is sufficient to accommodate lateral earth loads.
- E. Unless otherwise recommended by Soils Reports prepared by qualified geotechnical ENGINEERS, place fill in 8 inch layers, loose measure, and compact to the following Standard Proctor densities, ASTM D-698, at optimal moisture content:

Below building foundations and floor slabs:	95%
Below streets and in public right-of-way:	95%
Below sidewalks and parking pavements:	95%
Below foundations, floor slabs, streets, parking and driveways, top 1.0 foot:	100%
Below grassed and landscaped areas:	90%
Below natural terrain:	85%

3.08 FINAL GRADING

- A. Restore and grade excavated areas to finished contours as shown on the Drawings or to original lines and grades. Finish grade to remove loose materials and debris within the construction right-of-way and to allow for restoration of ground cover.
- B. Construct slopes and ditches to convey rainfall runoff in the manner and direction occurring prior to construction.
- C. Where finished grades and elevations are shown on the Drawings, fine grade to within 0.1 foot.
- D. For a period of one year following acceptance of the project, repair all areas subject to settlement within 30 days of receipt of written notice from the OWNER. Repairs include establishment of specified ground cover.

3.09 DISPOSAL OF WASTE MATERIALS

- A. To the maximum extent use suitable excavated trench materials for backfilling or other purposes on the construction site. Dispose of unsuitable materials in a legal manner, acceptable to the OWNER'S representative.
- B. Dispose of unsuitable materials consisting of wood, construction debris and unsuitable soils in a legally acceptable manner.
- C. Do not dump waste materials on private property without first receiving the property OWNER'S written permission.

3.10 TESTING

- A. Provide written documentation to the OWNER prepared by a Georgia licensed ENGINEER to assure compaction densities meet or exceed requirements of this specification.
- B. Conduct compaction/density testing as follows:
  - 1. Trenching under buildings: One test per 50 linear feet of trench length per foot of backfill depth; two test minimum per foot of backfill depth.
  - 2. Trenching under roads, streets and parking areas: One test per 100 linear feet of trench length per 2 feet of backfill depth; two tests minimum per 2 feet of backfill depth.
  - 3. Trenching under open/landscaped areas: One test per 200 linear feet of trench length per three feet of backfill depth.

END OF SECTION

## SECTION 02 250 FINISH GRADING

### 1.00 GENERAL

#### 1.01 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General, and Supplementary Conditions apply to work of this section.

#### 1.02 DESCRIPTION

- A. This Section of the Specifications and related drawings describes requirements pertaining to finish grading. Coordinate work of this Section with Landscaping Work for the Project which may be specified by others.

### 2.00 PRODUCTS

#### 2.01 TOPSOIL

- A. All topsoil necessary to complete the work shall be obtained from topsoil stockpiles from grading and excavating operations and from approved topsoil sources on the site. Topsoil shall be natural, friable, topsoil characteristic of representative soils in the vicinity that produce heavy growths of crops, grass, or other vegetation. Topsoil shall be free from tree roots, stones, and other materials that hinder grading, planting, and maintenance operations, and free from noxious and other objectionable weed seeds and toxic substances.

### 3.00 EXECUTION

#### 3.01 DEPOSITING, SPREADING AND PREPARATION OF TOPSOIL AREAS

- A. Do not start work until after construction work on curbs, and paved areas has been substantially completed, and rough grading has been completed, inspected and accepted by Engineer.
- B. Prior to spreading topsoil, the subgrade shall be pulverized to a minimum depth of two inches.
- C. Topsoil shall be uniformly distributed and evenly spread to a minimum thickness of 4 inches. Topsoil shall be spread so that planting can proceed with little additional soil preparation.
- D. Any finished grade that is not free from lumps and foreign material as described in Paragraph 2.1 will not be acceptable.
- E. After placement, finish grade topsoil to levels, grades and contours as shown. Maintain surfaces to indicated finished grades. Deposit whatever additional topsoil may be required to take care of any settlement or erosion. Rake surfaces upon which additional topsoil is to be deposited or otherwise prepare to insure proper bond.
- F. Till in order to provide a good bed. Hand tools such as a lawn rake, grading rake, steel tined speed rake, "yardevator", potato hook or spiker aerator shall be used during cultivation operations.
- G. These tools and equipment plus any other that the Contractor desires to use shall be employed during spreading of all topsoil to insure smooth draining grades and a fine graded surface upon which to receive landscaping.

END OF SECTION



## SECTION 02 276 MODULAR BLOCK RETAINING WALL

### 1.00 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to work included in this section.

#### 1.02 DESCRIPTION

- A. Work under this section includes the design, permitting and construction of proprietary modular retaining wall systems, including geotechnical fabrics, drainage products, and miscellaneous accessories.
- B. Related work specified elsewhere includes:

Temporary Sed. & Erosion Control	02100	
Earthwork		02200
Finish Grading		02250

#### 1.03 SITE INFORMATION

- A. The data on indicated subsurface conditions are not intended as representations or warranties of the continuity of such conditions. It is expressly understood that the OWNER will not be responsible for interpretations or conclusions drawn there from by the CONTRACTOR.
- B. Additional soil investigations may be made by the CONTRACTOR at no cost to the OWNER, provided such operations are acceptable and approved in writing by the ARCHITECT.

#### 1.04 SOIL QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. The CONTRACTOR will retain the services of a soils consultant to test for compliance with these specifications. When fill or backfill is required to be compacted to any specified density, the ARCHITECT may order such fill or backfill to be laboratory tested in order to ascertain compliance with specifications requirements. Tests will be executed during modular retaining construction.

#### 1.05 SUBMITTALS

- A. Prior to the Contractor's submittal to Fulton County for a Retaining Wall Permit and the ordering of modular retaining wall components and accessories, submit the following for the ARCHITECT'S review and approval:
  - 1. Modular block wall construction drawings, prepared by a Georgia Licensed Engineer, indicating wall plans, elevations, sections and details, together with materials and installation specifications and requirements, design loads, and appropriate notes. Provide a copy of Fulton County Retaining Wall permit application documents for Owner's records.
  - 2. Manufacturers' data and catalog cut-sheets indicating proposed wall color, block type, texture, and module configuration.
  - 3. Manufacturers' data and catalog cut-sheets for wall construction accessories including geotechnical materials, drainage products, and miscellaneous items.

### 2.00 PRODUCTS

#### 2.01 MODULAR WALL COMPONENTS

- A. Provide split-stone facing modular wall components, color and style to be selected by the Architect, as manufactured by Keystone, or approved equal.
- B. Design wall system based upon available site information or such other information that may be needed to assure a satisfactory installation that will not evidence settlement or distortion due to settlement of underlying soils or loads due to retained soils. Geotechnical information in addition to that currently available may be obtained by the wall manufacturer/installer at no additional cost to the OWNER, only after obtaining the OWNER'S written permission to enter the site and perform testing.
- C. Provide a complete wall system that meets or exceeds all design criteria as required for modular block retaining wall permitting in Fulton County. A copy of the approved retaining wall permit must be submitted to the Architect for review.

**2.02 GEOTECHNICAL COMPONENTS**

- A. Provide geotechnical products, including synthetic earth reinforcing materials and drainage fabrics that have a demonstrated performance record and that have been successfully used previously with the proposed modular wall components.

**2.03 MISCELLANEOUS ACCESSORIES AND COMPONENTS**

- A. Provide miscellaneous accessories and components such as connecting devices that have a demonstrated performance record and that have been successfully used with the proposed modular wall components.

**3.00 EXECUTION**

**3.01 DELIVERY AND STORAGE**

- A. Deliver and store modular wall components and accessories on the site in a manner to protect against deterioration and discoloration.

**3.02 WALL CONSTRUCTION**

- A. Coordinate wall construction with other trades to assure timely installation of utilities and other construction.
- B. Construct the retaining wall and related items in accordance with the manufacturer's approved drawings. Make no changes unless authorized in writing by the OWNER.

**3.03 CLEAN-UP**

- A. Clean-up and leave the construction site free of debris and unused wall components and accessories unless specifically authorized to do otherwise. Burial or burning of waste materials is specifically prohibited unless otherwise authorized.

END OF SECTION

## SECTION 02 361 SOIL TREATMENT FOR TERMITE CONTROL

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Chemical soil treatment.

#### 1.02 REFERENCES

- A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; United States Code; 1947 (Revised 1988).
- B. Agriculture Department of the State of Georgia: "Rules of the Georgia Structural Pest Control Commission", current edition.

#### 1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.
  - 1. Toxicant manufacturer's actual container label. Highlight Environmental Protection Agency (EPA) registration number.
  - 2. Environmental Protection Agency (EPA) hazardous materials handling sheet.
  - 3. Manufacturer's Safety Data Sheet (MSDS).
- C. Application Reference Drawing: For each toxicant application made, submit a separate drawing of the structure showing the specific areas treated, including any utility areas. The submitted drawing shall indicate the address of the structure, the date of application, the linear footage of the structure, total square footage of the structure and the volume of toxicant applied to each area.
- D. Manufacturer's Application Instructions: Indicate caution requirements, chemical to be used, concentrations, and application instructions.
- E. Record moisture content of soil before application, date and rate of application, and areas of application.

#### 1.04 PROJECT CONDITIONS

- A. Scheduling:
  - 1. Make applications of toxicants during normal working hours.
  - 2. Treated area shall dry for not less than 12 hours after application, before being covered with subsequent construction.
- B. Post signs in application areas warning that soil treatment has been applied. Remove signs before treated areas are covered by other construction.
  - 1. Signs shall be 4"x 5" minimum and posted as required.

#### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing this type of work and:
  - 1. Having minimum of 5 years documented experience.
  - 2. Approved by manufacturer of treatment materials.
  - 3. Certified by the State of Georgia in accordance with the requirements of the Department of Agriculture.
    - a. Copy of current State of Georgia pest control license.

#### 1.06 REGULATORY REQUIREMENTS

- A. Conform to the requirements of the Georgia Structural Pest Control Commission (current edition with amendments) for application of all toxicant materials.
- B. Toxicants:
  - 1. Any toxicant used shall meet the requirements of Federal Insecticide, Fungicide and Rodenticide Act, 7USC 136-136y for use in controlling termite infestation of buildings without being injurious.
  - 2. Toxicants shall be currently registered with the United States Environmental Protection Agency (EPA) and/or the Georgia Department of Agriculture for use as intended.
    - a. No applied concentrations shall be lower than the minimum nor greater than the maximum specified on the product label for the termiticide used as a soil termiticide application.

#### 1.07 SEQUENCING

- A. Apply toxicant 12 hours prior to installation of vapor barrier under slabs-on-grade or as recommended by the certified installer.

#### 1.08 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Special Warranty:
  - 1. Provide five year installer's warranty against damage to building caused by termites.
    - a. Include coverage for repairs to building and to contents damaged due to building damage. Repair damage and, if required, re-treat at no additional cost during warranty period.
  - 2. Make retreatment upon evidence of subterranean termite activity.
  - 3. State application date and chemicals used, including quantities and concentrations.
  - 4. Owner's Option Renewal Warranty: Provide renewable warranty on year-to-year basis at end of five-year period at Owner's option, for fee agreed upon at time of renewal.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Soil Treatment Chemicals:
  - 1. DowElanco; Dursban TC.
  - 2. Chemical mixture containing as active ingredient Chlorpyrifos O,O-diethyl-O (3,5,6-trichloro-2 pyridinyl) phosphorothioate as 42.8%; proportioned at two gallons liquid concentrate to 98 gallons water (1% emulsion).
- B. Toxicant Concentrations:
  - 1. DowElanco; Dursban TC.
  - 2. Chemical mixture containing as active ingredient Chlorpyrifos O,O-diethyl-O (3,5,6-trichloro-2 pyridinyl) phosphorothioate as 42.8%; proportioned at two gallons liquid concentrate to 98 gallons water (1% emulsion).
- C. Alternate Chemicals:
  - 1. Follow manufacturer's recommendations for mixing: Cypermethrin; permethrin; iridacloprid; fipronil; bifenthrin; esfenvalerate; deltamethrin; cyfluthrin; boric acid; silica gel; and propoxur.
- D. Toxicant Chemical Visual Identification: EPA and State of Georgia approved; synthetically color dyed to permit visual identification of treated soil.
- E. Diluent: Recommended by toxicant manufacturer.

#### 2.02 PART 3 EXECUTION

2.03 EXAMINATION

- A. Verify that soil surfaces are unfrozen and sufficiently dry to absorb toxicant, and ready to receive treatment. Do not apply toxicant after rain.
- B. Verify final grading is complete.

2.04 APPLICATION

- A. Spray apply toxicant in accordance with manufacturer's instructions.
  - 1. Apply chemical in low pressure spray water solution, maintaining continuous agitation procedures in mixture to prevent chemical separation. Follow manufacturer's written instructions for protection of treated surfaces prior to cover.
- B. Apply toxicant at following locations at rates indicated:
  - 1. Under Slabs-on-Grade and Flatwork-on-Grade
    - a. Fill dirt: One (1) gallon per ten (10) square feet.
    - b. Washed gravel or other coarse material: One and one-half (1-1/2) gallons per ten (10) square feet.
  - 2. Under Footings:
    - a. Fill dirt: One (1) gallon per ten (10) square feet.
    - b. Washed gravel or other coarse material: One and one-half (1-1/2) gallons per ten (10) square feet.
  - 3. Foundation Walls:
    - a. Apply treatment to each side of wall.
    - b. Four (4) gallons per ten (10) lineal feet per foot of depth.
  - 4. Other area applications including penetrations:
    - a. Adjacent slabs-on-grade and ancillary slabs (entry slabs, condenser pads, equipment pads, stair exit slabs and similar constructions)
    - b. Fill dirt: One (1) gallon per ten (10) square feet.
    - c. Washed gravel or other coarse material: One and one-half (1-1/2) gallons per ten (10) square feet.
- C. Re-treat disturbed treated soil with same toxicant as original treatment.
- D. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

2.05 PROTECTION OF FINISHED WORK

- A. Install warning signage indicating presence of treated soils.
- B. Do not permit soil grading over treated work.

**END OF SECTION**



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## SECTION 02 480 PERMANENT GROUND COVER

### 1.00 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to work of this section.

#### 1.02 DESCRIPTION OF WORK

- A. Extent of permanent ground cover work is shown on drawings and in schedules.
- B. It is specifically intended to establish ground cover in a timely manner to minimize erosion from the site. Proper installation and maintenance of ground cover will be required of the CONTRACTOR until all slopes and surfaces have become stabilized by a growing, viable ground cover. NO SPECIFIC PAYMENT WILL BE MADE FOR REPLANTING GROUND COVER THAT FOR ANY REASON HAS FAILED TO DEVELOP FULL, MATURE GROWTH IN ORDER TO STABILIZE GROUND SURFACES AND PRESENT EROSION.
- C. The CONTRACTOR may use any supplemental means for which the ARCHITECT does not object, to help assure an established ground cover.

#### 1.03 QUALITY ASSURANCE

- A. Subcontract ground cover installation to a single firm specializing in that type of work.
- B. Coordinate work of this Section with Landscaping Work for the Project which may be specified by others.

#### 1.04 SUBMITTALS

- A. Certification: Submit manufacturer's or vendor's certified analysis for soil amendments and fertilizer materials. Submit other data substantiating that materials comply with specified requirements.
- B. Submit seed vendor's certified statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed for each grass seed species.

### 2.00 PRODUCTS

#### 2.01 SOIL AMENDMENTS

- A. Lime; Natural dolomitic limestone containing not less than 85% of total carbonates with a minimum of 30% magnesium carbonates, ground so that not less than 90% passes a 10-mesh sieve and not less than 50% passes a 100-mesh sieve.
- B. Commercial Fertilizer: Complete fertilizer of neutral character.

#### 2.02 GRASS MATERIALS

- A. Grass Seed: Provide fresh, clean, new-crop seed complying with tolerance for purity and germination established by Official Seed Analysis for North America.

#### 2.03 MISCELLANEOUS LANDSCAPE MATERIALS

- A. Anti-Erosion Mulch: Provide clean, seed-free salt hay or threshed straw of wheat, rye, oats or barley.

3.00 EXECUTION

3.01 PREPARATION

A. Preparation for Planting Ground Cover

1. Loosen subgrade of ground cover areas to a minimum depth of 4". Remove stones over 1-1/2" in any dimension and sticks, roots, rubbish and other extraneous matter. Limit preparation to areas which will be planted promptly after preparation.
2. Fine grade ground cover areas to a smooth even surface with a loose fine texture. Roll, rake and drag lawn areas, remove ridges and fill depressions as required to meet finish grades. Apply fertilizer and lime as follows:

Nitrogen	10 lbs./1000 sq. ft.
Phosphorous	10 lbs./1000 sq. ft.
Potash	10 lbs./1000 sq. ft.
Lime	10 lbs./1000 sq. ft.

- B. Moisten prepared ground cover areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting lawns. Do not create a muddy soil condition.
- C. Restore ground cover areas to specified condition if eroded or otherwise disturbed after finish grading and prior to planting.

3.02 SEEDING OF GROUND COVER

- A. Do not use wet seed or seed which is moldy or otherwise damaged in transit or storage.
- B. Sow seed using a spreader or seeding machine. Do not seed when wind velocity exceeds 5 mi. per hr. Distribute seed evenly over entire area by sowing equal quantity in 2 directions at right angles to each other. Sow not less than 10 lbs./1000 sq. ft.
- C. Rake seed lightly into 1/8" of soil, roll lightly, and water with a fine spray.
- D. Protect seeded slopes against erosion with erosion netting or other methods acceptable to the ARCHITECT.
- E. Protect seeded areas against erosion by spreading mulch after completion of seeding operations. Spread uniformly to form a continuous blanket not less than 1-1 1/2" loose measurement over seeded areas.
- F. Water newly planted areas and keep moist until cover is established.

3.03 HYDROSEEDING GROUND COVER

- A. Mix specified seed, fertilizer, pulverized mulch and an asphaltic emulsion or other "tacking media" in water, using equipment specifically designed for hydroseed application. Continuous mixing until uniformly blended into homogenous slurry suitable for hydraulic application.
- B. Apply slurry uniformly to all areas to be seeded. Rate of application as required to obtain specified seed sowing rate.
- C. Water newly planted areas and keep moist until ground cover is established.

3.04 MAINTENANCE

- A. Begin maintenance immediately after planting.

- B. Maintain permanent ground cover for not less than 45 days and longer as required to establish an acceptable lawn.
- C. Maintain permanent ground cover by watering, fertilizing, weeding, mowing, trimming and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

3.05 CLEANUP AND PROTECTION

- A. During installation of permanent ground cover work, keep pavements clean and work area in an orderly condition.
- B. Protect permanent ground cover work and materials from damage due to construction operations. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed.

3.06 INSPECTION AND ACCEPTANCE

- A. When work is completed, including maintenance, ARCHITECT will, upon request, make an inspection to determine acceptability. When inspected work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected by ARCHITECT and found to be acceptable.

END OF SECTION



## SECTION 02 610 ASPHALT PAVING

### 1.00 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, and Supplementary Conditions apply to work of this section.

#### 1.02 DESCRIPTION OF WORK

- A. This section and related drawings describes requirements pertaining to paving work, including other items of work required for a complete installation.

#### 1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork, Section 02200.
- B. Portland Cement Concrete Walkways & Curbing, Section 03311.

#### 1.04 COORDINATION

- A. Coordinate work to ensure complete and proper construction and installation of related items of work. Drainage structures, pipe and similar drainage work will be executed as indicated on drawings.

#### 1.05 REFERENCE STANDARDS

- A. Where the term "Referenced Standard" is used in these Project Specifications, it shall be interpreted as referring to the current edition of "Standard Specifications, Construction of Roads and Bridges", Department of Transportation, State of Georgia, 1983, Referenced Divisions of the "Standard" are hereby made a part of this Project Specification insofar as they may be termed applicable. In no case will requirements for "Method of Measurement" and "Basis of Payment be considered as applicable to this Project Specifications.

#### 1.06 SUBMITTALS

- A. Prepare and submit complete shop drawings for following items of work in accordance with contract requirements.
  - 1. Stone Base Course - Materials Certification
  - 2. Asphaltic Concrete - Certification of Mix Design

#### 1.07 SAMPLING & TESTING

- A. Sample mineral aggregate in accordance with AASHTO T2, latest revision.
- B. Sample asphalt materials in accordance with ASTM D140, latest revision.
- C. Sample asphalt/ aggregate mixture in accordance with AASHTO T168, latest revision.

- D. Test asphalt materials in accordance with AASHTO requirements applicable to the asphalt specified. If an AASHTO procedure to the asphalt specified. If an AASHTO procedure is not available, use an equivalent ASTM method.
- E. Test mineral aggregate in accordance with the following methods, latest revision.
- |   |             |
|---|-------------|
| Amount Finer Than No. 200 sieve in Aggregate                                      | AASHTO T11  |
| Unit Weight of Aggregate  | AASHTO T19  |
| Sieve Analysis, Fine and coarse Aggregate   | AASHTO T27  |
| Sieve Analysis of Mineral Filler  | AASHTO T37  |
| Abrasion of Coarse Aggregate, Los Angeles Machine                                 | AASHTO T96  |
| Plastic Fines in Graded Aggregate and Soils<br>by use of the Sand Equivalent Test | AASHTO T176 |
- F. Test mixture for asphalt content by "Method of Test for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures", AASHTO T164, latest revision.
- G. Test mixture for compliance with aggregate grading requirement by "Method of Test for Mechanical Analysis of Extracted Aggregate", AASHTO T30, latest revision.

**1.08 JOB CONDITIONS**

- A. Place asphalt mixture only when specified density can be achieved. Do not place asphalt if mixture has cooled so as to prevent obtaining optimal density.
- B. Do not place asphalt paving on a wet surface or when weather conditions prevent proper hardening or finishing.
- C. Do not place asphalt paving without first providing traffic control as required by the General Requirements Section of the Contract Documents.
- D. Observe safe working conditions at all times. Provide workmen with appropriate safety equipment and apparel. Comply with all applicable Occupational Safety and Health Act requirements during the construction period.

**2.00 PRODUCTS**

**2.01 ASPHALT MATERIALS**

- A. Provide asphalt materials for the mixture hereinafter specified. Provide materials meeting the requirements of AASHTO M226, latest revision.
- B. Provide cutback asphalt for prime coat, MC-30, MC-70 or MC250, meeting the requirements of AASHTO M82, latest revision.
- C. Provide emulsified asphalt complying with requirements of AASHTO M140 or M208, latest revision for tack coat, SS-1, SS-1h, CSS-1 or CSS-1h, diluted one part water to one part asphalt.

**2.02 MINERAL AGGREGATES**

- A. Provide mineral aggregate of crushed stone, crushed gravel, stone or slag screenings, sand, mineral filler or a combination of two or more of those materials. Other mineral aggregates having demonstrated acceptability may be used.
- B. Provide coarse aggregate meeting requirements of AASHTO D, 692, latest revision.
- C. Provide fine aggregate meeting requirement of AASHTO D1073, latest revision.
- D. Provide mineral filler meeting requirements of AASHTO D242, latest revision.
- E. Do not use mineral aggregate having a history of polishing for surface course paving mixture.

**2.03 BASE COURSE MIXTURES**

- A. Portland Cement Stabilized Base Course: Provide a portland cement stabilized base course consisting of the proportions of portland cement as indicated by the Drawings.
- B. Graded Aggregate Base Course: Provide graded aggregate base materials meeting requirements of the referenced standard, Section 815.

**2.04 ASPHALT PAVING MIXTURES**

- A. General: Provide asphalt paving mixtures for leveling, base and surface courses, together with prime and tack courses, as shown on the project drawings and meeting requirements of the referenced standard, Section 400.

**3.00 EXECUTION**

**3.01 SUBGRADE PREPARATION**

- A. Prepare subgrade to true required line and grade, properly compacted with all loose foreign material removed.
- B. Prepare defective areas in existing paved subbase surfaces by removing loose, unsound material to an undamaged base. Patch with asphalt concrete binder as may be necessary to produce a surface conforming to adjacent pavement.
- C. Remove excess asphalt from existing paved subbase by method approved by the ENGINEER.
- D. Apply a prime coat of cutback or emulsified asphalt to the graded aggregate base course at a rate of 0.30 gal. per s.y. in accordance with requirements set forth in the referenced standard.
- E. Apply tack coat of asphalt cement or emulsified asphalt at the ratio of 0.15 ga. per S.Y. in accordance with requirements set forth in the referenced standard to all base or leveling courses to receive additional paving. Include vertical surfaces of concrete curbs, existing concrete and asphalt pavements and concrete structure adjoining new asphalt paving. Do not apply a greater area of tack coat than can be paved during the same day.

**3.02 ASPHALT PLANT OPERATIONS**

- A. Conduct asphalt plant mixing operations including materials storage, preparation and quality control operations in accordance with requirements set forth by the referenced standard.

3.03 ASPHALT CONCRETE PLACEMENT

- A. Place each course of asphalt concrete in one or more lifts with an asphalt spreader to obtain the nominal compacted thickness as indicated on the Drawings.
- B. Place each lift to a minimum thickness not less than two times the maximum aggregate size and not greater than that required to obtain optimal uniform density and smoothness.
- C. Place each lift in a continuous operation. Correct any irregularities before final compaction of the mixture.
- D. Compact asphalt mixture immediately following placement. Initial rolling with a steel wheeled tandem roller, steel three-wheeled roller, vibrating or pneumatic tired roller following the paver as closely as possible. Use a pneumatic timed intermediate roller. Continue rolling to obtain required density and eliminate marks from previous rollings.
- E. Compact small areas with a vibrating plate compactor or head tamper to achieve required density.

3.04 ACCEPTANCE

- A. General: Acceptance of asphaltic concrete paving construction will be based upon relative density, thickness and smoothness.
- B. Density: Relative density is the ratio, expressed as a percent, between the density of the in-place compacted finished pavement and the theoretical maximum specific gravity of density obtained by laboratory compaction. Both field specimen and laboratory (on site) specimen shall be obtained from the same truck load of material. On the average, (2) two different samples shall be taken per day during paving operations. Finished pavement should be core sampled at the frequency of 1 core per (10,000 S.F.) of pavement area. Paved material will be acceptable when the average relative density determinations is equal to or greater than 96 percent, with no sample less than 94 percent. Compaction tests on in-place compacted graded aggregate base course should be conducted at the frequency of (1 test/6000 S.F.) of area.
- C. Thickness: The compacted base and surface courses shall have a thickness not less than indicated as being required on the Drawings. An additional surface course lift will be required to make up for deficient thickness.
- D. Smoothness: The completed surface course shall have a surface tolerance of 1/8 inch +/- when measured parallel to the paving centerline, and 1/4 inch +/- when measured perpendicular to the paving centerline, each relative to a 10 foot straight edge.

3.05 CLEAN-UP

- A. Remove and dispose of all surplus materials, rubble and other debris resulting from work of this Section in a legally acceptable manner. Do not dispose of waste or excess paving materials on-site. Leave the entire site in a broom-clean condition.

END OF SECTION

**SECTION 02 710 FENCING**

1:00 GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions apply to work of this section.

1.02 DESCRIPTION OF WORK

A. This work includes the construction of chain link fence and gate in accordance with these specifications at the location shown on the plans.

2:00 PRODUCTS

2.01 MATERIALS

A. Fabric: Base metal of commercial quality steel wire No. 11 gage to withstand breaking load of 850 lbs. zinc coat by the hot-dip process after fabrications, or fabricate from wire zinc-coated by the electrolytic or hot-dip process, weight of not less than 1.2 ozs. per square foot surface area. Zinc grade ASTM Designation B6. Vinyl coat/ color as indicated on the project drawings.

B. Post, Gates and Appurtenances:

1. Posts, braces and rails: standard weight galvanized with 2.0 ounces of hot dipped zinc in accordance with ASTM-A120.
2. Gate Frames: Standard weight galvanized with 2.0 ounces of hot dipped zinc in accordance with ASTM-A120.

<i>Fence Item</i>	<i>Outside Diameter</i>	<i>Weight/Foot</i>
End of corner posts	2.875	5.79
Gate Posts:		
6' and less	2.875	5.79
Over 13' to 18'	6.625	18.97
Over 18'	8.625	24.70
Gates		
Exterior frame and interior bracing	1.660	2.27
Rails and post braces	1.66	2.27
Intermediate posts	1.90	2.72

3. Gates shall be of the swing or roll-aside type, complete with latches, stops, keepers, hinges.
4. Gate frames shall be constructed of round tubular members welded at all corners or assembled with fittings. Welds shall be painted with zinc-based paint. Where corner fittings are used at gates use truss rods of 3/8 inch nominal diameter to prevent sag or twist. Vertical intermediate bracing as required, maximum 8 ft. apart. Gate leaves 10 ft. or over shall have a horizontal brace or one 3/8 inch diagonal truss rod. Gate filler shall be of the same fabric as specified for fence and shall be attached securely to gate frame at interval of 15 inches.
5. Hinges of adequate strength, and with large bearing surfaces for clamping in position. The hinges shall not twist or turn under the action of the gate. The gates shall be capable of being opened and closed easily by one person.

6. Latches, Stops, and Keepers shall be provided for all gates.
7. Post top shall fit over the outside of posts to exclude moisture.
8. Stretcher Bars not less than 3/16 by 3/4 inch and not be less than 2" shorter than the full height of the fabric. The stretcher bars arranged by positive mechanical means. One stretcher bar shall be provided for each gate, end post, and two for each corner and pull post.
9. Ties, or Clips of adequate strength for attaching the fabric at intervals not exceeding 15 inches.
10. Provide a top and bottom tension wire.
11. Top and center parks shall be round and be in lengths not less than 18 feet, and shall be fitted with couplings for connecting the lengths into a continuous run. the couplings shall not be less than 6 inches long, with 0.070 in. minimum wall thickness. Suitable ties or clips shall be provided in sufficient number for attaching the fabric securely to top rail at internals not exceeding two (2) feet.

### 3.00 EXECUTION

#### 3.01 STANDARDS FOR INSTALLATION

- A. All materials and workmanship shall be first class in every respect, shall be done in a neat workman-like manner.
- B. Line post shall be spaced at intervals not to exceed 10 ft. In general, in determining the post spacing, measurement will be made parallel to the slope of the natural ground, and all posts shall be placed in a vertical position.
- C. All posts shall be set in holes of diameter and depth as indicated below:
  - Line Post: 6' fabric height, 9" Hole Diameter at Top, 38" Hole Depth, 36" Post Embedment.
  - Terminal Post: 6' Fabric Height, 12" Hole Diameter at Top, 38" Hole Depth, 36" Post Embedment.
  - After the post has been set and plumbed, the hole shall be filled with 3,000 PSI concrete. The exposed surface of the concrete shall be crowned to shed water.
- D. End, corner, gate and pull posts shall be braced to the nearest post with a galvanized pipe horizontal brace used as a compression member, and a galvanized 3.8 inch steel truss rod and truss tightener, used as a tension member. All fences must have braces on all terminals. All changes in direction of fence line of 30 degrees or more shall be considered as corners. Pull post shall be used at all abrupt changes in grade.
- E. Chain Link Fabric: Shall be placed on the inside of the fence.
- F. The fabric shall be stretched taut approximately two (2) inches above the ground, and securely fastened to the posts. The fabric shall be cut and each span shall be attached independently at all terminal posts. Fastening to terminal post shall be with stretcher bars and fabric bands spaced at maximum 15 inch intervals. Fastening to line post shall be with tie wire, metal bands, or other approved method, attached to maximum 15 inch intervals. The top edge of the fabric shall be fastened to the top tension wire with wire ties at intervals not exceeding 24 inches. The bottom edge of fabric shall be fastened to the bottom tension wire with ties at intervals not exceeding two feet.
- G. Rolls of wire fabric shall be joined by weaving a single strand into the ends of the rolls to form continuous mesh.

END OF SECTION



## SECTION 02 719 WATER SERVICE PIPING

### 1.00 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to work of this section.

#### 1.02 DESCRIPTION OF WORK

- A. Extent of water service piping work is shown on drawings.  
Exterior water service piping work includes, but is not limited to, the following,
  - 1. Domestic water and fire mains, valves, etc.
- B. Excavation and backfilling for exterior water service piping is specified in Section 02200, Earthwork.

#### 1.03 QUALITY ASSURANCE

- A. Installer: A firm with at least two years of successful installation experience on exterior water service piping projects similar to this project.
- B. Code Compliance: Comply with applicable portions of National Standard Plumbing Code and local plumbing codes where more stringent.

#### 1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each product specified for water service piping.

### 2.00 PRODUCTS

#### 2.01 PRESSURE PIPE

- A. General: Provide ells, tees, reducing tees, wyes, couplings, and other required piping accessories of same type and class of material as conduit, or of material having equal or superior physical and chemical properties acceptable to ARCHITECT.
- B. Copper water service piping (CU-K) fabricated from type "K" hard copper manufactured in accordance with requirements of ANSI B16.18 having soldered joints conforming to ASTM B32.
- C. Plastic water service piping, schedule 40, (PVC-40) meeting the following requirements:
  - Pipe: ASTM D2241, "Standard Spec. for Polyvinyl Chloride Plastic Pipe (SDR-PR)".
  - Push-on Joint: ASTM D3139, "Standard Specification for Joints for Plastic Pressure Pipe Closing Flexible Elastomeric Seals".
  - Gasket: ASTM F477, "Standard Specifications for Elastomeric Seals (Gaskets) for Joining Plastic Pipe".
  - PVC Material: ASTM D1784, "Standard Specifications for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated (CPVC) Compounds".

- Potable Water Service Certification: NSF No. 14, "National Sanitation Foundation Standard No. 14 for Thermoplastic Materials, Pipe, Fittings, Valves, Traps and Joining Materials".

### 3.00 EXECUTION

#### 3.01 INSTALLATION

- A. General: Install exterior water service piping system in compliance with local governing regulations.
- B. Street Main Connection: Arrange and pay for tap in water main, or size and in location indicated, by local Water Utility Company.
- C. Install water line at a minimum depth of 18 inches on a uniform grade to building connection. Backfill trench with excavated material, free of stones three (3) inches or larger. Place a locator wire in the pipe trench prior to backfilling.
- D. Interior Inspection: Inspect conduit to determine whether line displacement or other damage has occurred.
- E. Cleaning Conduit: Clear interior of conduit of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.

Place plugs in end of uncompleted conduit at end of day or whenever work stops.

#### 3.02 TESTING

- A. Perform hydrostatic testing of completed conduit lines in accordance with local authorities having jurisdiction.

END OF SECTION

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## SECTION 02 720 - SEWER COLLECTION SYSTEM

### 1.00 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to work of this section.

#### 1.02 DESCRIPTION OF WORK

- A. Extent of sewer collection system work is shown on drawings. Sewer collection system work includes, but is not limited to the following:
  - 1. Sanitary sewer conduits.
  - 2. Storm sewer conduits.
  - 3. Manholes, frames and covers.
  - 4. Catch basins, frames and gratings.
- B. Comply with the requirements of Section 02210, Trenching & Backfilling for excavation and backfilling required in connection with sewer collection system work.

#### 1.03 QUALITY ASSURANCE

- A. Installer: A firm specializing and experienced in sewer collection system work for not less than two years.

#### 1.04 SUBMITTALS

- A. Shop Drawings: Submit shop drawings for system, showing conduit types and sizes, locations, elevations and slopes for horizontal runs. Include details of underground structures, accessories, fittings, and connections.

### 2.00 PRODUCTS

#### 2.01 CONDUIT MATERIALS

- A. General: Furnish ells, tees, reducing tees, wyes, couplings, increasers, crosses, transitions and end caps of same type and class of material as conduit, or of material having equal or superior physical and chemical properties as acceptable to the ARCHITECT.
- B. Poly (vinyl chloride) pipe (PVC), meeting requirements of ASTM D 3034, latest revision, having a minimum SDR of 35. Provide pipe and fitting joints using flexible elastomeric seals complying with requirements of ASTM D 3212, latest revision.
- C. Ductile Iron Pipe (DIP) conforming to requirements of ANSI/A21.51 and having push-on joints conforming to requirements of ASNI A21.11.
- D. Reinforced Concrete Pipe (RCP) Bell and spigot joint pipe meeting requirements of ASTM C76-78, Class 3, or as shown on the drawings, with compression gasket joints meeting requirements of ASTM C443-78.

2.02 CONCRETE MANHOLES

- A. Concrete Base: Precast or cast-in-place, at Contractor's option. Use concrete which will attain a 28-day compressive strength of not less than 3000 psi.
- B. Precast Concrete Manholes: ANSI/ASTM C 478, sized as indicated. Concentric cone precast top.

2.03 MASONRY MATERIALS

- A. Concrete Masonry Units: ANSI/ASTM C139.
- B. Manhole Brick: ANSI/ASTM C32-73, Grade MS.
- C. Sewer Brick: ANSI/ASTM C32-73, Type SM.
- D. Masonry Mortar: ANSI/ASTM C270, Type S.

For minor amounts of mortar, packaged materials complying with ANSI/ASTM C387, Type S, will be acceptable.

2.04 METAL ACCESSORIES

- A. Manhole Frames and Covers: Grey cast iron, ANSI/ASTM A 48, Class 35 B; or ductile iron, ASTM A536-80, Grade 65-45-12.

Comply with requirements of FS RR-F-621 for type and style indicated.

Furnish covers with cast-in legend ("STORM" or "SANITARY" to suit installation) on roadway face.

- B. Manhole Steps: Grey cast iron, ANSI/ASTM A48, Class 30 B, integrally cast into manhole sidewalls, unless otherwise indicated.

2.05 MISCELLANEOUS MATERIALS

- A. Bedding Stone: Meeting requirements of Ga. D.O.T. Specifications, Section 800, No. 57 stone.
- B. Stone Rip-Rap: Meeting requirements of Ga. D.O.T. Specifications, Section 805, Type (size) as shown on the Drawings.
- C. Plastic Marking Tape: Four mil polyethylene, 6 inches minimum width in bright color with the words "SEWER LINE BELOW" printed continuously.

3.00 EXECUTION

3.01 INSTALLATION OF CONDUIT

- A. General
  - 1. Install conduit in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated.

2. Inspect conduit before installation to detect apparent defects. Mark defective materials with white paint and promptly remove from site.
  3. Lay conduit beginning at low point of a system, true to grades and alignment indicated with unbroken continuity of invert.
  4. Install gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements.
- B. Plastic Pipe: Install plastic piping in accordance with pipe manufacturer's instructions. Compact backfill uniformly to maintain pipe true circular cross-section.
- C. Cleaning Conduit: Clear interior of conduit of dirt and other superfluous material as work progresses. Maintain swab of drag in line and pull past each joint as it is completed.

Place plugs in ends of uncompleted conduit at end of day or whenever work stops.  
Flush lines between manholes if required to remove collected debris.

- D. Interior Inspection: Inspect conduit to determine whether line displacement or other damage has occurred.

Make inspections after lines between manholes, or manhole locations, have been installed and approximately two feet of backfill is in place and at completion of project.

If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, correct such defects to satisfaction of ARCHITECT.

### 3.02 UNDERGROUND STRUCTURES

A. Masonry Construction Manholes

1. At CONTRACTOR'S option, use either sewer brick or concrete masonry units to construct masonry manholes.
2. Mix mortar with only enough water for workability. Retempering of mortar will not be permitted. Keep mortar mixing and conveying equipment clean. Do not deposit mortar upon, or permit contact with, the ground.
3. Lay masonry in mortar so as to form full bed with ends and side joints in one operation, and with full bed and vertical joints, nor more than 5/8" wide. Protect fresh masonry from freezing and from too rapid drying.
4. Apply a 1/2" thick mortar coating on both interior and exterior wall surfaces.
5. Where manholes occur in pavements, set tops of frames and covers flush with finish surface. Elsewhere, set tops three inches above finish surface, unless otherwise indicated.
6. Use epoxy-bonding compound where manhole steps are mortared into masonry walls.

- B. Precast Concrete Manholes: Place precast sections as shown on drawings. Where manholes occur in

pavements, set tops of frames and covers flush with finish surface. Elsewhere, set tops 3" above finish surface, unless otherwise indicated.

Use epoxy bonding compound where manhole steps are mortared into manhole ls.

Provide rubber joint gasket complying with ASTM C 443.

Apply bituminous mastic coating at joints of sections.

### 3.03 BACKFILLING

- A. General: Conduct backfill operations of open-cut trenches closely following laying, jointing and bedding of pipe, and after initial inspection and testing are completed.

### 3.04 TESTING SANITARY SEWERS

- A. Perform testing of completed conduit lines in accordance with local authorities having jurisdiction.
- B. Test the completed conduit in accordance with one of the following three methods:

- 1. Infiltration Testing: Install suitable weirs in manholes selected by the ARCHITECT to determine the leakage of ground water into the sewer. 5000 feet is the maximum length of line for each infiltration test. Measure leakage only when all visible leaks have been repaired and the ground water is two feet above the top of the pipe. If leakage in any section of the sewer line exceeds 50 gpd/inch diameter/mile, locate and repair leaks. Repair methods must be approved by the ARCHITECT. After repairs are completed, re-test for leakage.

Furnish, install, and remove the necessary weirs, plugs, and bulkheads required to perform the leakage tests. Where continuous monitoring of flow level is required, the OWNER will provide and operate monitoring equipment.

- 2. Exfiltration Hydrostatic Test: Test pipe between manholes with a minimum of ten feet hydrostatic pressure, measured at the center of the pipe of the upstream manhole.

Close the ends of the pipe in the test section with suitable watertight bulkheads. Insert into each bulkhead at the top of the sewer pipe a 2-inch pipe nipple with an elbow. At the upper end of the test section, connect a 2-inch nipple to a 12-inch riser pipe. Fill the test section of the pipe through the pipe connection in the lower bulkhead fitted with a tight valve, until all air is exhausted and until water overflows the riser pipe at the upper end. Water may be introduced into the pipe twenty-four hours prior to the test period to allow complete saturation. Fit house service lines, if installed, with suitable bulkheads having provisions for the release of air while the test section is being filled with water.

During the test period, which extends over a period of two hours, introduce water into the riser pipe from measured containers at such intervals as are necessary to maintain the water level at the top of the riser pipe. The total volume of water added during the test period shall not exceed that specified for infiltration.

3. Low-Pressure Air Test: Prior to air testing, thoroughly clean and wet the section of sewer between manholes. Immediately after cleaning or while the pipe is water soaked, test the sewer with low-pressure air. At the CONTRACTOR'S option, sewers may be tested in lengths between manholes or in short sections (25 feet or less) using Air-Lock balls pulled through the line from manhole to manhole. Supply air slowly to the plugged sewer section until internal air pressure reaches approximately 4.0 psi. After this pressure is reached and the pressure is allowed to stabilize (approximately 2 to 5 minutes), the pressure may be reduced to 3.5 psi before starting the test. If a 1.0 psi drop does not occur within the test time, then the line has passed the test. If the pressure drops more than 1.0 psi during the test time, the line is presumed to have failed the test, and the CONTRACTOR will be required to locate the failure, make necessary repairs, and retest the line. Minimum test time for various pipe sizes, in accordance with ASTM C828, as amended to date, is as follows:

Nominal Pipe Size (Inches)	T(time) Min/100 ft.
8	1.2
10	1.5
12	1.8
15	2.1
18	2.4
21	3.0
24	3.6
30	4.8
36	6.0
42	7.3

Required test equipment, including Air-Lock balls, braces, air hose, air source, timer, rotometer as applicable, cut-off valves, pressure reducing valve, 0-15 psi pressure gauge, 0-5 psi pressure gauge with gradations in 0.1 psi and accuracy of +/- 2%, shall be provided by the CONTRACTOR.

The CONTRACTOR is cautioned to observe proper safety precautions in performance of the air testing. It is imperative that plugs be properly secured and that care be exercised in their removal. Take every precaution to avoid the possibility of over-pressurizing the sewer line.

- C. Conduct testing only when the OWNER'S representative is present. Prepare records of all tests to indicate sewer line, line length, date, time, technician conducting test, and other information that may be required by the ARCHITECT.

**END OF SECTION**



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## SECTION 02 810 - IRRIGATION SYSTEM

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Design of landscape irrigation system.
- B. Pipe and fittings, valves, sprinkler heads, emitters, bubblers, and accessories.
- C. Control system.

#### 1.02 REFERENCES

- A. ASTM B 32 - Standard Specification for Solder Metal; 2000.
- B. ASTM B 42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 1998.
- C. ASTM D 2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2000.
- D. ASTM D 2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 1996a.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 1997.

#### 1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate piping layout to water source, location of sleeves under pavement, location and coverage of sprinkler heads, components, plant and landscaping features, site structures, schedule of fittings to be used.
  - 1. Provide actual precipitation rates and times for each zone.
- C. Installation Details and Specifications: Provide details and instructions for installation of each irrigation component not otherwise indicated on the shop drawings.
  - 1. Prior to trenching, Contractor shall submit proposed type of trenching equipment to be used for approval by the Fulton County Landscape Architect.
- D. Product Data: Provide component and control system and wiring diagrams.
- E. Samples: Provide one outlet of each type, with housing. Accepted samples may be used in the Work.
- F. Record Documents: Record actual locations of all concealed components piping system.
- G. Operation and Maintenance Data:
  - 1. Provide instructions for operation and maintenance of system and controls, seasonal activation and shutdown, and manufacturer's parts catalog.
    - a. Provide name and telephone number for local distributor of each sprinkler component.
  - 2. Provide schedule indicating length of time each valve is required to be open to provide a determined amount of water.

#### 1.04 DESIGN REQUIREMENTS

- A. System Design:

1. Provide head to head coverage in all areas. Provide separate zones for areas with different water requirements. Water requirements shall be determined by analyzing slope, sunlight, soils and plant types in a given area. All heads shall be selected, installed and adjusted to minimize overspray.
2. Drip zones may be utilized for shrub beds on some sites. The County Landscape Architect will approve the use of drip irrigation on a case-by-case basis. When drip irrigation is approved it shall be as manufactured by Netafin (also available under the Toro name) and incorporating appropriate pressure reducing valves and filters.
3. Make water connections as close to the water meter as possible. Provide a brass ball valve type manual cutoff directly behind the meter.
4. All piping and wiring under paved areas shall be located in PVC sleeves. All piping shall be sized to ensure a velocity of not less than 5 fps using class 200-pipe. All systems shall include a pressure reducing valve regardless of measured system pressure.
5. Provide a weather tight, lockable dual programmable master valve controller. Controller shall have battery backup for clock and must be capable of being programmed to run on even or odd calendar days on a four day cycle without requiring adjustments at the end of a 31-day month. Locate controller in an easily accessible location and as approved by the Architect. All system wiring shall be encased and sealed to provide a weathertight installation. Provide spare wires between the controller box and all field valve boxes. Wire connections shall be 3M-DBY.
6. Each system shall include rain and freeze sensors that shall be properly installed and field tested to verify proper operation.
7. Backflow Prevention: Provide backflow preventors as required by the local water authority and Fulton County. All above ground backflow preventors shall be installed in galvanized, copper or other approved material piping system.
  - a. Backflow Housing: Install backflow preventor in an insulated, heated structure equal to Hot Box (small insulated fiberglass flip-top style enclosure) ASSE 1060 Certified and shall meet a heat requirement of 60W minimum. The structure shall not be a simulated rock product. Coordinate and provide all electrical components for the complete installation of the backflow preventor and protective housing.

#### 1.05 QUALITY ASSURANCE

- A. Irrigation Designer Qualifications: Design of the irrigation system shall be by an IA Certified Irrigation Designer who is a current member of the American Society of Irrigation Consultants .
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years of experience.
- D. Provide all controllers and valves from a single manufacturer.

#### 1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable code for piping and component requirements.
- B. Provide certificate of compliance from authority having jurisdiction indicating approval of products in system.

#### 1.07 PRE-INSTALLATION MEETING

- A. Convene two weeks prior to commencing work of this Section.
  1. Attendees: County Landscape Architect, Architect, General Contractor and Irrigation Subcontractor.

#### 1.08 COORDINATION

- A. Coordinate the work with site backfilling, landscape grading and delivery of plant life.

#### 1.09 WARRANTY

- A. Provide a Certificate of Warranty Registration and written guarantee of the work and materials for a period of one (1) year from the Date of Substantial Completion. Warranty shall include all labor and materials for modifying the system to cover any dry areas that may be discovered during the warranty period.

#### 1.10 CLOSEOUT REQUIREMENTS

- A. Record drawings and Instructions:
  - 1. Drawings: Upon completion of installation, furnish one set of reproducible and one set of printed record drawings indicating the type and location of all sprnkler heads, valves, drains and pipelines to scale and dimensioned. Dimensions shall be from easily located stationary points as they relate to all valves, mainlines, and wiring. Note all approved substitutions of size and material not conforming to approved shop drawings.
  - 2. Instructions and Parts List: Submit complete, concise instruction sheets and parts lists indicating all operating equipment and weathering techniques. Bind all materials in vinyl-clad notebooks of 8-1/2 x 11 size and labeled for contents. Provide three (3) separate copies.
  - 3. Submittal of Closeout Documents is required prior to Substantial Completion.
- B. Instruction to Owner: After completion of installation, testing and acceptance of the system, the Contractor shall instruct the Fulton County Landscape Architect in the operation and maintenance of the system.

#### 1.11 MAINTENANCE SERVICES

- A. Installer's Field Services: Prepare and start systems under provisions of Section 01700.
- B. Provide one complete spring start-up and a fall shutdown.

#### 1.12 EXTRA MATERIALS

- A. See Section 01600 - Product Requirements, for additional provisions.
- B. Furnish extra components:
  - 1. Two sprinkler heads of each type and size.
  - 2. Two valve keys for manual valves.
  - 3. Two valve box keys.
  - 4. Two keys for valve markers.
  - 5. Two wrenches for each type head core and for removing and installing each type head.

### **PART 2 PRODUCTS**

#### 2.01 IRRIGATION SYSTEM

- A. Electric solenoid controlled underground irrigation system, with low point self drain.
- B. Manufacturers:
  - 1. Rain Bird Sales, Inc: [www.rainbird.com](http://www.rainbird.com).
  - 2. Toro Company: [www.toro.com](http://www.toro.com).
  - 3. Weathermatic: [www.weathermatic.com](http://www.weathermatic.com).

#### 2.02 PIPE AND FITTING MATERIALS

- A. PVC Piping and Fittings: ASTM D 2241; 200 psi pressure rated upstream from controls, 200 psi downstream.
  - 1. Piping shall be homogenous material free from visible cracks, holes, foreign materials, blisters, wrinkles and permanently marked with the manufacturer's name, material, size and schedule type. Piping shall bear the NSF seal.

2. All piping and fittings two and one half (2-1/2) inches or larger shall be equipped with gaskets.
  3. All piping and fittings smaller than two and one half (2-1/2) inches shall be connected at Contractor's option.
- B. All plastic fittings shall be molded and manufactured of the same material as the piping and shall be suitable for solvent weld, slip joint ring tight seal or screwed connections.
- C. Slip fitting socket tapers shall be sized such that a dry unsoftened pipe end conforming to these special provisions can be inserted no more than half way into the socket. Plastic saddle and flange fittings shall not be used. Only Schedule 80 pipe may be threaded.
- D. Solvent Cement: ASTM D 2564 for PVC pipe and fittings.
- E. Sleeve Material: Class 200 PVC or stronger.
1. Provide sleeves under proposed pavement areas prior to subgrade and base construction.
  2. Provide a minimum horizontal separation of 18" and a maximum of 24" clearance below bottom of curb.
  3. Provide a minimum horizontal separation of 24" and maximum 36" from center to center.
- tx23764. Stub up sleeve pipe 12" above ground surface and cap. Paint cap end to provide easy identification.
5. Locations of sleeves on drawings is diagrammatic. Adjust all locations of sleeves as necessary for the completed design and to accommodate existing vegetation, utilities, or other existing conditions.
  6. Bore Locations: Provide bore of ample size to accommodate sleeve size as designed or indicated.

#### 2.03 OUTLETS

- A. Outlets: Brass construction.
- B. Rotary Type Sprinkler Head: Fixed type with screens; fully adjustable for flow and pressure; size as indicated; with letter or symbol designating degree of arc and arrow indicating center of spray pattern.
- C. Spray Type Sprinkler Head: Fixed surface head.
- D. Emitter: Adjustable outlet, non-clogging, with two trickle tubes.

#### 2.04 VALVES

- A. Zone Control Valves
1. Globe-type diaphragm valves of normally closed design with bronze bodies and covers. Provide flow stem adjustment for each valve.
    - a. Operation: Integrally mounted heavy-duty 24 volt AC solenoid, NEC Class II Circuit classification. Provide solenoid with epoxy resin coated coil in a stainless steel housing. Solenoids shall be completely waterproof, suitable for direct underground burial.
- B. Backflow Preventers: Iron body construction, double check valve type.

#### 2.05 VALVE BOXES

- A. Manufacturer: Ametek or approved equal.
- B. Provide thermoplastic valve access boxes and locking covers of the size required to permit access to the valve.
- C. Install valve boxes on at least a two (2) cubic foot gravel base to provide foundation and drainage.
- D. Locate valve boxes to provide 1/2" clearance below finished grade.

## 2.06 CONTROLS

- A. Controller: Provide automatic controller with microprocessor solid state control and visible readout display. System shall be dual programmable master valve.
  - 1. Housing: Provide lockable weathertight housing.
  - 2. Emergency power source: Provide battery back-up for the clock.
  - 3. Programming: Provide processor with capability of even or odd day control on 4 day cycle without adjustment at the end of a 31-day month.
- B. Control Wiring: Provide wire type UF, UL approved, for direct burial.
  - 1. All wiring to be color coded.
  - 2. Wire sizes: Provide minimum 14 gauge wire for control wiring and minimum 12 gauge for common wiring.
  - 3. All wiring connections and splices shall be made in valve boxes. All wiring between boxes shall be continuous with no splices.

## 2.07 THRUST BLOCKS

- A. Provide minimum 1 cubic foot of concrete for each inch of pipe diameter for thrust blocks. Thrust blocks shall prevent vertical or horizontal displacement of piping in any direction unless noted otherwise on the design drawings. Provide thrust blocking for piping three (3) inches in diameter and larger.

## **PART 3 EXECUTION**

### 3.01 EXAMINATION

- A. Verify location of existing utilities.
- B. Verify that required utilities are available, in proper location, and ready for use.

### 3.02 PREPARATION

- A. Piping layout indicated is diagrammatic only. Route piping to avoid plants, ground cover, and structures.
- B. Layout and stake locations of system components.
- C. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system.

### 3.03 TRENCHING

- A. Excavate trenches for sprinkler of sufficient depth and width to permit proper handling and installation of piping and control devices.
  - 1. In rocky areas, trenching shall be at least two (2) inches below piping and filled with a selected fill dirt or sand bedding to bottom of pipe elevation.
- B. Trench to accommodate grade changes.
- C. Maintain trenches free of debris, material, or obstructions that may damage pipe.
- D. Provide open, unsupervised trenches with barricades or other protection to prevent undue hazard to project site occupants.

### 3.04 INSTALLATION

- A. Install pipe, valves, controls, and outlets in accordance with manufacturer's instructions. Make allowances for expansion and contraction of piping materials as recommended by the piping material manufacturer.
  - 1. Plastic pipe shall be cut using a handsaw or hacksaw and cut to square using a sawing vice. Burrs at cut ends shall be removed prior to installation so that water flow is not obstructed.

2. Plastic-to-plastic joints shall be solvent welds or slip seal joints. Solvent shall be compatible with fittings and piping and as recommended by the manufacturer. Allow at least 24 hours after connection of fittings and pipe before pressurizing system.
- B. Connect to utilities.
- C. Set outlets and box covers at elevations specified.
- D. Use threaded nipples for risers to each outlet.
- E. Install control wiring in accordance with electrical specifications, Division 16, and National Electrical code, latest edition. Provide a twenty-four (24) inch expansion coil at each valve to which controls are connected and at 100 foot intervals. Bury wiring beside pipe.
  1. Wiring beneath walks, drives, or other permanent surfaces shall be placed in sleeves.
  2. Wires shall be spliced at valve boxes only.
- F. After piping is installed, but before outlets are installed and backfilling commences, open valves and flush system with full head of water.

### 3.05 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01400. Notify Architect twenty-four (24) hours prior to testing.
- B. After all new sprinkler piping and risers are in place and connected for a given section, and prior to installation of sprinkler heads, open all control valves and flush system piping using a full head of water.
- C. Sprinkler main shall be tested under normal water pressure for a period of twelve (12) hours. If leaks occur, make repairs to defective installation and repeat testing.
- D. After successful testing of the piping system, install sprinkler heads and test installation for proper coverages and operation. Repair any defects in connections and make adjustments to any automatic or self-actuating equipment.

### 3.06 BACKFILLING

- A. After successful inspection and testing, begin backfilling operations. Protect piping from displacement.
- B. Backfill materials shall be selected soils with no lumps or rocks larger than three (3) inches. The top twelve (12) inches of backfilling shall be topsoil, free of rocks, subsoil, trash or other foreign matter.
- C. The backfill shall be thoroughly compacted and evened off with the adjacent soil.
  1. Use only selected fill dirt or sand for backfilling in rocky areas where bedding has been installed (see paragraph 3.03.A.1) and fill to a depth of four (4) inches above the pipe.
- D. Backfill in six (6) inch lifts as needed to bring the soil to its original density and compaction.

### 3.07 ADJUSTING

- A. Adjust control system to achieve time cycles required.
- B. Adjust head types for full water coverage as directed.
- C. In the spring following the year of installation, the Contractor shall repair any settlement of the trenches by bringing them to grade with topsoil, and seeding or sodding with the existing lawn type(s).

### 3.08 DEMONSTRATION

- A. Instruct Owner's personnel in operation and maintenance of system, including adjusting of sprinkler heads. Use operation and maintenance material as basis for demonstration.

**END OF SECTION**



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## SECTION 02 870 - SITE FURNITURE

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

#### 1.02 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard printed product literature.
- C. Shop Drawings: Indicate method of site anchorage and all field connections necessary for completed installation .
- D. Samples: Submit two powdercoat finish samples, 2 inch x 6 inch in size, illustrating all variations in finish surfaces.
- E. Manufacturer's Instructions: Indicate in writing all directions for installation.
- F. Maintenance Data: Submit all written recommendations for cleaning and maintaining surfaces.
- G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

#### 1.03 PRE-INSTALLATION MEETING

#### 1.04 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver seating to project site in manufacturer's standard unopened protective wrapping.
- B. Store all materials under cover and elevated above grade.

#### 1.05 PROJECT CONDITIONS

- A. Coordinate seating installation with size, location and installation of service utilities.

#### 1.06 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty for seating and seating components.

### PART 2 PRODUCTS

#### 2.01 BASE BID MANUFACTURER

- A. Landscapeforms
  - 1. Product: Plexus Collection Seating.
    - a. Seating: Straight seats - 22" wide x 24" deep; 72" length per bench.
    - b. Supports: Horizontal - 3" O.D. @ .120" wall thickness; Vertical - 2-1/2" O.D. @ .120" wall thickness.
    - c. Vertical Embed Supports: 2-1/2" O.D. @ .120" wall thickness.
    - d. Color: To be selected from manufacturer's standard powdercoat finish colors.
- B. Other Acceptable Manufacturers:
  - 1. Form+Surfaces
    - a. Seating: Vista; 72" length per bench.
    - b. Color: To be selected from manufacturer's standard powdercoat finish colors.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that seating components are free of damage or defects prior to installation.

3.02 INSTALLATION

- A. Install embed seating in accordance with manufacturer's instructions.
- B. Install seating plumb and level.

3.03 CLEANING

- A. Contractor shall remove protective material supplied by seating manufacturer.
- B. Clean all visible surfaces after installation.
- C. Protect installed seating] from subsequent construction operations.

**END OF SECTION**

## SECTION 03 100 - CONCRETE FORMWORK

### PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Related work specified elsewhere:
  - 1. Concrete Reinforcement
  - 2. Cast-In-Place Concrete
  - 3. Concrete Finishes
  
- B. Work specified in Section includes concrete formwork, accessories, form coating, and polystyrene fill.

#### 1.02 SUBMITTALS

- A. Manufacturer's Literature: Submit copies of manufacturer's product specifications and installation instructions for manufactured products, including form sealer and release agent.
  
- B. Submit list of completed projects using forming system intended to be used for this project.
  
- C. Shop Drawings; Formwork: Submit shop drawings prepared by a registered professional Engineer for fabrication and erection of forms for specific finished concrete surfaces, as indicated. Show general construction of forms including jointing, special form joint or reveals, location and pattern of form tie placement, and other items which affect exposed concrete visually.  
  
Architect's review is for general architectural applications and features only. Design of formwork for structural stability and efficiency is Contractor's responsibility.
  
- D. Samples: Submit the following:
  - 1. Form ties: Samples on each type

#### 1.03 QUALITY CRITERIA

- A. Industry Standards:
  - 1. American Concrete Institute, ACI-301, Specifications for Structural Concrete for Buildings.
  - 2. American Concrete Institute, ACI-318, Building Code Requirements for Reinforced Concrete.
  - 3. American Concrete Institute, ACI-347, Recommended Practice for Concrete Formwork.
  - 4. American Concrete Institute, ACI-SP-15, Field Reference Manual.

5. Southern Pine Inspection Bureau (SPIB) Grading Rules.
  6. Western Wood Products Association (WWPA) Grading Rules.
  7. American Plywood Association (APA) Grading Rules.
- B. Allowable Tolerances:
1. Adhere to the following industry standards, latest edition except as otherwise indicated.
    - a. American Concrete Institute (ACI) Standards:
      - 1) ACI 301, "Specification for Structural Concrete for Buildings"
      - 2) ACI 318, "Building Code Requirements for Reinforced Concrete"
    2. Allowable Tolerances in Finished, Exposed Work:
      - a. In linear buildings lines, elevations and conspicuous lines and arises: Maximum  $\pm$  3/16" in length of 20'-0" maximum;  $\pm$  3/8" in length of 40'-0" or more.
      - b. In cross-sectional dimension:  $\pm$  3/16".
      - c. See Section 03300 CAST-IN-PLACE CONCRETE for FF and FL Requirements.  
Provide formwork as required to obtain the required FF and FL finish.
- C. Camber:
1. Forms for beams and slabs, framing between supports shall be cambered 3/8" at center line for each 10 feet of total span, unless noted otherwise on drawings.
  2. Cantilevered beams and slabs shall be cambered 3/4" at outer end, for each 10 feet of span, unless noted otherwise on drawings.

## PART 2 - PRODUCTS

### 2.01 FORMING MATERIALS

- A. Lumber:
- For work unexposed in finished project: #2 Southern Yellow Pine.
- B. Plywood:
1. For interior exposed concrete: MDO-EXT-APA or B-B Plyform EXT-APA.
  2. For unexposed concrete: C-C EXT-APA.
- C. Metal or Plastic Forms: Smooth, undented, clean steel and new plastic forms may be used with

Architect's approval, provided required texture and finish can be achieved.

- D. Earth Forms: Forms for footings may be cut into earth, provided that earth is dry, stable, level and sound.
- E. Form Ties: Breakback type with 5/8" removable vinyl sleeve of 1" diameter breakback cone type.
- F. Plywood Form Sealer: Colored polyurethane coating of type acceptable to plywood manufacturer, for sealing cut edges of plywood.
- G. Form Release Agent: Type as required to eliminate staining or causing surface imperfections in finishes. Use same brand form release agent for all forms.

### PART 3 - EXECUTION

#### 3.01 FORMWORK CONSTRUCTION

- A. Comply with ACI 347 for shoring and reshoring in multistory construction, and as herein specified.
- B. Extend shoring at least 3 floors under floor or roof being placed for structures over 4 stories. Shore floor directly under floor or roof being placed, so that loads from construction above will transfer directly to these shores. Space shoring in stories below this level in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members where no reinforcing steel is provided. Extend shores beyond minimums to ensure proper distribution of loads throughout structure.
- C. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to safely support work without excessive stress or deflection.
- D. Keep reshores in place a minimum of 15 days after placing upper tier, and longer if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.
- E. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.
- F. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- G. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
- H. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- I. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.

Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

- J. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set time to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
- K. Layout of joints in formwork shall be in accordance with acceptable practice. Joints shall bear tightly on solid back-up.
- L. Clean forms of dirt, debris, concrete and foreign matter before each use or re-use. Examine forms prior to each re-use and replace those which developed defects affecting the strength, tightness or visual appearance.
1. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.
  2. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.
  3. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.
  4. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.
- M. Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.
- N. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.
- O. Re-Use of Forms:
1. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
  2. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.
- P. Form Release, Cleaning and Tightening:

1. Immediately prior to placement of reinforcing, apply form release agent to forms in accordance with manufacturer's instructions. Rate of application shall be constant to prevent discoloration of concrete. Remove excess material immediately.
  2. Cleaning and tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.
- Q. Construct bulkheads with keys at separation of pours, except as otherwise noted on drawings. Locations of bulkheads shall be as indicated on approved shop drawings.

### 3.02 REMOVAL OF FORMS

- A. Contractor shall assume full responsibility for removal of formwork and forms shall be removed in such a manner as to insure complete safety of structure.
- B. Under ordinary weather conditions, wall forms and other vertical forms for concrete which do not span between definite supports may be removed after the concrete has hardened sufficiently to resist damage from removal operations.
- C. Concrete slabs and other members which span between definite supports shall attain 70 percent of the specified 28-day strength before removal of the forms. Shores for cantilevered beams and slabs shall remain in place for at least an additional 21 days. At the Contractor's option, faster reshore removal may be determined by tests.
- D. After removing forms, horizontal members shall be promptly reshored at midspan until 28-day strength of concrete is attained. Reshores shall remain in place until concrete is at least 15 days old. No floor shall be loaded in excess of live load for which designed unless adequate shores are placed beneath members supporting the concentration of load without overloading any other portion of the structure.

END OF SECTION



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## SECTION 03 200 - CONCRETE REINFORCEMENT

### PART 1 - GENERAL

#### 1.01 DESCRIPTION

- A. Related work specified in other Sections includes: concrete formwork, and cast-in-place concrete.
- B. Work described in this Section includes reinforcement, metal and plastic accessories.

#### 1.02 SUBMITTALS

Submit in accordance with contract conditions the following:

- A. Shop Drawings: Indicate bar bending details, bar lists and placement drawings for all reinforcement. Indicate dimensions on placement drawings.
  - 1. Form of placement drawings, including schedules, details and notes, shall contain same information as contract drawings.
  - 2. Show wall reinforcement in elevation.
  - 3. Indicate locations of accessories, conduits, and piping to be embedded in concrete.
- B. Mill Tests:
  - 1. Submit, for each heat of reinforcing steel, certifying mill tests conducted in accordance with ASTM requirements.
  - 2. Costs for tests shall be borne by Contractor.
  - 3. Unidentified bundles may be rejected or tested at request of the Owner's Representative. Cost of tests on unidentified bundles shall be borne by the Contractor.
  - 4. Submit three copies of each test report to Architect.
  - 5. Submit one copy of report of chemical analysis of reinforcing steel requiring welding to the Architect for review.

#### 1.03 DELIVERY, STORAGE & HANDLING

- A. Deliver reinforcement in bundles with waterproof tags. Maintain tags attached until material is incorporated into work.
- B. Deliver and handle materials to prevent damage to or weakening of reinforcement.
- C. Prevent accumulation of rust or debris on reinforcement during storing. Store off ground and under cover.

#### 1.04 QUALITY CRITERIA

- A. Adhere to the following industry standards, latest edition, except as otherwise indicated.

1. American Concrete Institute (ACI) Standards:
  - a. ACI 301, Specifications for Structural Concrete for Buildings.
  - b. ACI 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures.
  - c. ACI 318, Building Code Requirements for Reinforced Concrete with supplements.
2. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice - Placing Reinforcing Bars.
3. American Welding Society (AWS) AWS D12.1.

## PART 2 - PRODUCTS

### 2.01 REINFORCEMENT

- A. Bars: Meeting ASTM A615, deformed type for #3 and larger bars.
  1. Ties and Stirrups: Grade 60, unless otherwise noted.
  2. All other bars: Grade 60, unless otherwise noted.
- B. Welded Wire Fabric: Meeting ASTM A185, cold-drawn, resistance welded.
- C. Tie Wire: 16 gauge annealed steel wire.
- D. Accessories:
  1. Prefabricated accessories shall comply with CRSI Manual of Standard Practice, Class E at exposed surfaces and Class A unexposed. Legs of all accessories used in exposed concrete shall be solid plastic or plastic coated.
  2. Accessories on earth: Footing and slab on ground reinforcement may be supported on solid concrete bricks.
  3. Support bars: To maintain height for top reinforcement shall be #5 minimum.

## PART 3 - EXECUTION

### 3.01 INSPECTION

- A. Examine surfaces designated to receive work described in this Section for conditions adversely affecting the finished work. Repair or replace surfaces not meeting tolerances or quality requirements imposed within specifications governing substrate construction prior to initiating this work.
- B. Review: Notify Owner's Representative at least 48 hours prior to placing of concrete to allow time for inspection of reinforcement. Place no concrete in forms without approval of reinforcement by Owner's Representative.

3.02 FABRICATION & ERECTION

- A. Shop fabricate reinforcement to shape and dimensions indicated on approved placement drawings. Bent bars shall be bent cold. Fabricate in accordance with ACI 315 and ACI 318.
- B. Metal reinforcement, at the time concrete is placed, shall be relatively free from rust scale and other coatings reducing bond. Use no bars with kinks or bends not shown on placement drawings.
- C. Place metal reinforcement in accordance with ACI 315, ACI 318 and placement drawings. Secure in position in forms. Top longitudinal bars in this section may be temporarily removed at the request of the Owner's Representative. Minimum slab reinforcement support spacing shall be as recommended by CRSI. Do not weld items to reinforcing steel unless a written proposal is specifically approved in writing by Owner's Representative.
- D. Protective concrete cover over reinforcement shall be as indicated on the drawings.
- E. When reinforcement splices are required for construction and are not shown on the drawings, the locations and lap lengths shall be approved in writing by the Owner's Representative. Splice in accordance with ACI 318. Mechanical compression splices will not be permitted unless prior written approval is obtained from Owner's Representative. Where welded splices are indicated, use full penetration butt welds in accordance with AWS specifications. Welded splices shall be inspected by an independent testing laboratory selected and paid by Contractor. Unless shown otherwise, spliced bars shall have a 42 bar diameter length lap splice.
- F. Install wire mesh reinforcing in sizes and locations indicated. Lap joints one wire spacing plus 2" and extend mesh to within 1" of edges of slabs on grade.
- G. Conduit and Pipes: Concrete cover shall be equal to cover for reinforcing bars. Embedded conduit diameter shall not exceed 1/3 slab or wall thickness. Tie down low conduit on top of bottom reinforcing bars. Space no conduit less than three diameters apart and minimum 1" separation from parallel reinforcing bars. Use no aluminum conduits or coupling in concrete.

**End of Section**



## SECTION 03 300 - CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.01 DESCRIPTION

A. Related work specified elsewhere includes:

1. Concrete Formwork
2. Concrete Reinforcement
3. Concrete Finishes

#### 1.02 SUBMITTALS

A. Mix Designs: Submit to the Architect for each type of concrete used on project, in advance of proposed use. Verify the design mix in accordance with Section 3.9 or 3.10 of ACI 301.

1. Previous Field Experience or Trial Mixtures: Concrete proportions may be established on the basis of previous field experience if sufficient and timely data is available for full compliance with Section 3.9 of ACI 301. Where acceptable records are not available trial mixtures shall be submitted to an approved testing laboratory for mix designs in accordance with Section 3.9.3.3 of ACI 301.
2. Where acceptable field test records or trial mixture data are not available the contractor may submit mix designs based on proportioning by empirical data in accordance with Section 3.10 of ACI 301.

B. Prequalify ready-mixed concrete suppliers according to the requirements of ASTM Specification C94, entitled "Ready-Mixed Concrete". Mix and transport concrete as required by ASTM C94, Paragraph 15.1 and 15.2.

#### 1.03 JOB CONDITIONS

A. Weather:

1. Precaution shall be taken to prevent high temperatures in fresh concrete during hot weather, in accordance with ACI 305. Water reducing set retarding admixtures shall be used in such quantities as recommended by concrete supplier to assure that concrete remains workable and lift lines will not be visible.
2. Cold weather placement shall be in accordance with ACI 306.

#### 1.04 DEFINITION

A. Normal Weight Concrete: Composed of ASTM C33 aggregate, cement and water, weighing 145 - 150 pounds/cubic foot, cured and air dried.

#### 1.05 QUALITY CRITERIA

- A. Adhere to the following industry standards, latest edition, except as otherwise indicated.
1. American Concrete Institute (ACI) Standards:
    - a. ACI 301, "Specification for Structural Concrete for Buildings"
    - b. ACI 318, "Building Code Requirements for Reinforced Concrete"
- B. Allowable Tolerances in Finished, Exposed Work:
1. In linear buildings lines, elevations and conspicuous lines and arrises: Maximum +/- 3/16" in length of 20'-0" maximum; +/- 3/8" in length of 40'-0" or more.
  2. In cross-sectional dimension: +/- 3/16".
  3. Finish all concrete slabs elevated and slab on grade using techniques which will provide the following flatness criteria:

	Minimum Local:	Specified Overall:
Parking Garages:		
Slab on Grade	FF20/FL15	FF13/FL10
Elevated Slabs	FF20/FL15	FF13/FL15
Carpeted With No Thin set Tile:		
Slab on Grade	FF25/FL20	FF17/FL13
Elevated Slabs	FF25/FL20	FF17/FL13
All Others:		
Slab on Grade	FF35/FL25	FF23/FL17
Elevated Slabs	FF30/FL20	FF20/FL13

- a. ACI 301, "Specification for Structural Concrete for Buildings"
- b. For shored construction, FL values do not apply if slab is tested after shoring is removed. When required FL values for elevated slabs greater than or equal to 35, FL shall be measured prior to form removal.
- c. For unshored construction, FL values do not apply except when required FL values for elevated slabs are greater than or equal to 50.
- d. All flatness tests for a given slab shall be performed within 72 hours of pour.
- e. Slabs which do not meet the required flatness (FF) and levelness (FL) criteria shall be repaired by grinding, planing, surface repair, retopping, or removal of the slab. Detailed drawings showing repair action and manufacture specification of materials to be used shall be submit and approved prior to corrective action. Measures shall be take to adjust finishing techniques to obtain the flatness and levelness criteria specified prior to additional placement of additional elevated or slab on grade.

- C. Location Tolerances for Cast-in items:
1. Inserts, pipe sleeves, bolts, etc., plus or minus 3/8".
  2. Flashing reglets, at edge of panel, plus or minus 1/4" total.

3. Reglets for glazing gasket, plus or minus 1/8".
4. Groove width for glazing gaskets, plus or minus 1/16".
5. Electrical outlets, hose bibs, etc., plus or minus 1/2".

## PART 2 - PRODUCTS

### 2.01 CONCRETE MATERIALS

- A. Portland Cement: Meeting ASTM C150, Type I or III, natural color, domestic manufacture. Only one brand of cement shall be used for exposed Architectural concrete throughout.
- B. Normal Weight Aggregate: Fine and coarse aggregate meeting ASTM C33.
- C. Air-Entraining Admixture: Meeting ATM C260. Add to produce air entrainment in accordance with ACI-318.
- D. Water-Reducing Admixture: Meeting ASTM C494.
- E. Chemical Retarders and Accelerators: Meeting ASTM C494. Add as required for weather conditions encountered.
- F. Nonshrink Grout:
  1. Acceptable products:
    - a. Gifford-Hill and Co., Supreme.
    - b. L&M Construction Chemicals Co., Crystex.
    - c. Master Builders Co., Master Flow 713.
    - d. Sonneborn Building Products, SonogROUT.
    - e. The Upco Co., Upcon High Flow 261.
    - f. U.S. Grout Corp., Five Star Grout.
    - g. W.R. Bonsal Co., Type A Construction Grout.
    - h. W.R. Meadows, Inc., 588.
  2. Characteristics: High flow, non-metallic, controlled expansive type grout.
- G. Water: Clean, potable and free of deleterious amounts of acid.
- H. Expansion Joint Filler Strips: Non-extruding, non-asphaltic cork or cane fiber.
- I. Calcium chloride or mixtures containing calcium chloride or fly ash shall not be used in concrete without Architect's approval.

- J. Water stops shall be extruded polyvinyl chlorides as manufactured by W.R. Meadows or approved equal. Size shall be 4" wide by 3/16" thick of the center bulb multi-rib type.

2.02 CONCRETE TYPES

A. Classes of Concrete:

The classes to be used under this contract shall be as follows, unless otherwise indicated on the Structural Drawings. Locations shall be as indicated on the drawings.

Class A - 3000 psi Standard Weight

Class B - 4000 psi Standard Weight

B. Concrete Mixtures:

The concrete shall be proportioned by the water-cement ratio method. The proportioning shall be based on the requirements of a plastic and workable mix within the slump range and strengths required. No concrete exposed to the exterior of the building shall have a water content exceeding 7 gallons per sack of cement. The following classes of concrete are required:

CLASSES OF CONCRETE	MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS LBS	MAXIMUM SLUMP INCHES
A	3000	3 - 5"
B	4000	3 - 5"

- C. Only concrete permanently exposed to weather shall be air-entrained.

2.03 CURING & SEALING COMPOUND

- A. Acrylic or sodium-silicate compound compatible with subsequent coatings or adhesives which seals and hardens the concrete surface. Compound shall meet ASTM C-309.

1. General use: Acrylic 100% resin base with fugitive dye. Acceptable; "Hydrocide Resin Base" by Sonneborn; "CS-309" by Meadows; "A-H Curing Compound #2" by Anti-Hydro.
2. For areas scheduled elastomer coated: Sodium-silicate type 35% 42.5 degrees Baume gravity. Acceptable: "Sonosil" by Sonneborn; "Cure-Hard" by Meadows; "Acruicon" by Anti-Hydro.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine surfaces designated to receive work described in this section for conditions adversely affecting the finished work. Repair or replace surfaces not meeting tolerances or quality requirements imposed within specifications governing substrate construction prior to initiating this work.

3.02 BATCHING & MIXING

- A. Batch and mix concrete in accordance with ASTM C94, except where more stringent requirements are specified.
- B. Truck mixer drums shall be thoroughly cleaned prior to each batching of concrete. Truck mixtures shall be loaded at only capacity which will insure uniform batch at slump specified. Non-uniform mixing shall be rejected.
- C. Mixing time shall start after all ingredients are in mixer. Minimum mixing shall be 70 revolutions at mixing speed, if charged to maximum capacity; 50 revolutions at mixing speed, if charged to less than maximum capacity. Discharge mixture from mixes within one hour of initial mixing.
- D. Additional water shall not be added to the mix except as directed by Architect, or allowed herein for hot weather concreting.
- E. Concrete shall be delivered at such a rate as will assure prompt discharge upon truck arrival. Place no concrete which has been discharged from mixer truck for longer than thirty minutes.
- F. Truck mixers with unacceptable batch of concrete will be rejected. Dispose of concrete legally and clean mixer prior to refill. Rejected mixers will be singled out on new delivery for slump and mix test.

### 3.03 PLACING

- A. Before placing concrete, preliminary work such as forms and reinforcing steel sleeves and embedded items shall be checked carefully, inspected and approved.
- B. Concrete shall be handled from mixer to place of final deposit as rapidly as practical by methods which shall prevent separation or loss of ingredients. Concrete shall be distributed by means equal to a steep-sided bottom drop concrete bucket and shall not be allowed a free fall of over four feet. The bucket shall have a capacity of not less than 1/2 cu. yd. Transporting and handling equipment shall be cleaned at frequent intervals and flushed thoroughly with water before and after each day's run. Water shall not be discharged into concrete forms.
- C. No concrete shall be placed in forms after initial set has taken. Retempering of concrete which has partially set is prohibited. Place concrete in the forms within 1-1/2 hours after initial batching. No placing will be permitted when the sun, temperature, wind or limitations of facilities prevent proper finishing and curing.
- D. Deposit concrete as near final position as possible to avoid rehandling. Place in uniform, horizontal layers 18 to 24 inches in depth; care being taken to avoid vertical joints or inclined planes. Piling up of concrete in forms in such a manner as to permit escape of mortar, or flow of the concrete itself, will not be permitted. Deposit concrete continuously and as rapidly as practical until entire unit of pour is completed, with thorough consolidation by vibrating to ensure a dense, homogeneous mass without voids or pockets. Concrete shall not be spaded at surfaces to receive architectural finishes.
- E. Transport and place pumped concrete in accordance with ACI requirements. Make provisions in formwork design and construction to handle effects of pump hammer. Equipment used to transport concrete shall be compatible with concrete reinforcing and desired finishes.

### 3.04 CONSOLIDATION

- A. Use vibrators for concrete consolidation. Place vibrators in concrete rapidly so as to penetrate into previous lift blending two layers and minimizing or eliminating entrapped air between concrete and form.

- B. Vibrator head shall not be allowed to come within 3" of form face.
- C. Use vibrators with steady, continuous motion in concrete mass and for long enough duration at each position in a pattern to permit maximum escape of air from concrete.
- D. Vibrators shall be 2-1/2" to 2-5/8" in diameter, with minimum frequency of 10,000 impulses per minute. Furnish number of vibrators as required to vibrate all concrete immediately upon placing. Maintain spare vibrators at project site in case of breakdown.

### 3.05 COLD WEATHER CONCRETING

- A. Take cold weather precautions when temperature on job site is at or below 40 degrees F.
- B. Heat water, aggregates, or both, to maintain the temperature of the concrete at the time of delivery at not less than 55 degrees F. Provide tarps, heaters, insulated forms, or other means to maintain the temperature of deposited concrete at not less than 40 degrees F for the first 7 days after placement. Calcium chloride or other accelerating admixtures will not be permitted unless approved in writing by the Architect.

### 3.06 HOT WEATHER CONCRETING

- A. Take hot weather precautions when temperatures on job site are at or above 75 degrees F.
- B. Add retarders to the concrete mix at the batch plant according to the mix design approved by the testing agency. Where necessary, cool aggregates or use chilled water or both to maintain concrete temperatures as delivered to the job site at or below 90 degrees F. Reject any truck mixer in which concrete temperatures are above 90 degrees F. Maintain truck discharge time within 1 hour of initial mixing and placement of discharged concrete within 30 minutes of initial discharge.
- C. In hot weather, up to 10% of design mix water may be added to truck mixers at the job site to replace water lost by evaporation. Mix for a minimum of 30 additional revolutions after water is added. Make slump test and take cylinders for compression test specimens from each truck to which water has been added. These additional cylinders shall not be counted in determining "frequency of testing" as defined in Concrete Testing Section. Cost for this additional testing shall be paid for by the Contractor.

### 3.07 CURING

- A. Cure concrete walls and columns for not less than 7 days after concrete has been placed. Use liquid curing compound, soaker hose, or burlap at Contractor's option.
  - 1. Apply curing compound immediately following the removal of forms. Apply curing compound in accordance with manufacturer's recommendations, covering all surfaces.
  - 2. Soaker hose: Put a garden type soaker hose along top of wall. Adjust the water supply to keep the top and sides of the walls constantly wet for not less than 7 days. Soaking operation shall be continuous, whether forms are in place or have been removed.
  - 3. Burlap: Cover tops and sides of concrete with burlap and keep burlap continuously wet 7 days.
- B. Cure concrete slabs for not less than 7 days. Cure surfaces indicated to receive elastomeric coatings,

waterproofing membranes, ceramic tile or special pattern tile by wetting or sodium silicate compound only.

1. Apply curing compound immediately following the slab finishing operation described in Concrete Finishing Section. Apply curing compound in accordance with manufacturer's recommendations, covering top surfaces of slab.
  2. Wetting concrete slabs: Place garden type soaker hose on slabs as soon as slabs can be walked on. Adjust the water flow to keep a constant film of water on slabs for not less than 7 days.
- C. If the concrete at 7 days does not develop 70% of specified 28-day strength, continue curing by methods described until tests indicate concrete has achieved 28-day specified strength.

### 3.08 ACCEPTANCE OF CONCRETE

- A. The strength of concrete will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the required 28-day strength and no individual strength test result is more than 500 psi below the required 28-day strength. Whenever this criteria is not met, core tests as described in Concrete Testing Section shall be taken in those areas with questionable concrete, as directed by the Architect.

END OF SECTION



SECTION 03 311

PORTLAND CEMENT CONCRETE PAVING

1.00 GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of the contract, including General and Supplementary Conditions apply to work of this section.

1.02 DESCRIPTION OF WORK

The extent of portland cement concrete walkways and curbing work is shown on the Drawings.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Earthwork, Section 02 200.
- B. Concrete Work, Section 03 301.

1.04 QUALITY OF CRITERIA

- A. Codes and Standards: Comply with the following codes, specifications and standards, except when more stringent requirements are shown or specified:
  - 1. American Concrete Institute, ACI-318, "Building Code Requirements for Reinforced Concrete."
  - 2. American Concrete Institute, ACI-SP-15, "Field Reference Manual."

2.00 PRODUCTS

2.01 FORMWORK

- A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork with plywood, metal, or other acceptable panel-type material to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
- B. Forms for Curbing: Use either manufactured metal forms or construct formwork with plywood or other acceptable material to provide continuous smooth radii and curb surfaces. Provide formwork with sufficient rigidity to withstand the pressure of newly-placed concrete without bow or deflection.
- C. Extruded Concrete Curbing: Concrete curbing may be placed by acceptable and suitable "string guided" machines to continuously extrude curbing conforming to an alignment established by a string line. Install curbing conforming to drawing details with the specified/indicated joints.

2.02 REINFORCING MATERIAL

- A. Reinforcing Bars (Rebar): ANSI/ASTM A615, Grade 60, deformed.
- B. Welded Wire Fabric (WWF): ANSI/ASTM A 185.
- C. Provide supports for reinforcing complying with Concrete Reinforcing Steel Institute (CRSI) recommendations. DO NOT USE WOOD.

2.03 READY-MIX CONCRETE

- A. Comply with requirements of ANSI/ASTM C 94, as herein specified. Delete references for allowing additional water for slump modification. Addition of water to a concrete batch will not be permitted

2.04 CONCRETE MATERIALS

- A. Portland Cement: ANSI/ASTM C150, Type 1.
- B. Normal Weight Aggregates: ANSI/ASTM C33.
- C. Water: potable.
- D. Air-Entraining Admixture: ANSI/ASTM C260.

2.05 BASE MATERIAL

- A. Graded Aggregate Base meeting requirements of the Georgia Department of Transportation Specifications Section 815.

2.06 RELATED MATERIALS

- A. Moisture-Retaining Cover: One of the following complying with ANSI/ASTM C171.
  - 1. Waterproof paper.
  - 2. Polyethylene film.
  - 3. Polyethylene-coated burlap.
- B. Liquid Membrane-Forming Curing Compound: Meeting requirements of Federal Specification TT-C800, Type 1.
- C. Joint Filler: Bituminous impregnated fiberboard meeting requirements of ASTM D1751.

2.07 PROPORTIONING AND DESIGN OF MIXES

- A. Design mix to provide normal weight concrete having a 3000 psi, 28 day compressive strength; 480 lbs. cement per cubic yard minimum; w/c ratio 0.58 maximum. Use 1.5 inch maximum sized aggregate.
- B. Use air-entraining admixture at the manufacturer's prescribed rate to obtain 2% to 4% entrained air.
- C. Maximum slump 5 inches.

3.00 EXECUTION

3.01 FORMWORK

- A. Design, erect support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.
- B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- C. Set machine guide string lines to the proper alignment.
- D. Driveway Paving Joints: Install expansion contraction and construction joints at locations and in accordance with details indicated on the project drawings.

3.02 PLACING REINFORCEMENT

- A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports, and as herein specified
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
- C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers as required.
- D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

**3.03 JOINTS**

- A. Walkway Contraction Joints: If not shown on the drawings, place construction joints at approximately 30 foot centers, and at changes in walkway alignment. Place 1/2 inch joint filler at construction joints so as to be 1/4 inch below finished surface. Stop reinforcing at construction joints.
- B. Walkway Construction Joints: Tool contraction joints at a spacing equal to twelve times the walkway thickness at a depth of 1/3 total walkway thickness. Place wire fabric reinforcing, if required, across contraction joints.
- C. Curbing Construction Joints: If not shown on the drawings, place construction joints at approximately 20 foot centers and at curb radius points. Place 1/2 inch joint filler at construction joints so as to be 1/4 inch below finished surface. Stop reinforcing at construction joints.

**3.04 CONCRETE PLACEMENT**

- A. Pre-placement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other trades to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete in accordance with ACI recommended practices.
- B. Placing Concrete: Deposit and consolidate concrete in a continuous operation, within limits of construction joints, until the placing of a section is completed.
- C. Bring surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, prior to beginning finishing operations.
- D. Maintain reinforcing in proper position during concrete placement operations.

**3.05 FINISH SURFACES**

- A. Float Finish (Flt-Fn): Apply float finish to driveway and parking areas and to other areas receiving a trowel finish.
- B. Broom Finish (BrmFn.): Apply broom finish to walkways and curbing. Immediately after trowel finishing, slightly roughen concrete surface by brooming with a coarse bristle broom perpendicular to long direction of walkway or curbing.
- C. Edges and Joints: Tool the edges of walkways and walkway joints to a 1/4 inch radius to achieve a uniform appearance throughout.

3.06 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

- B. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by curing compound, and by combinations thereof, as herein specified.

1. Provide moisture-cover curing as follows:

Cover concrete surfaces with moisture-retaining cover for curing concrete, place in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

2. Provide curing compound as follows:

Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

END OF SECTION

**SECTION 03 350 - CONCRETE FINISHES**

PART 1 - GENERAL

1.01 RELATED WORK

- A. Forming, mixing, and placing of concrete.

PART 2 - PRODUCTS

2.01 SEALER

- A. Sealer shall be wax free, resin free and varnish free compound, which seals and hardens the concrete surface. Approved "Guardian Clear Bond".

2.02 ABRASIVE AGGREGATE

- A. Abrasive Aggregate shall be applied at all non-slip exposed concrete slabs.
- B. Abrasive Aggregate shall be aluminum oxide or emery graded from particles retained on a #50 mesh screen to particles passed by a 1/8" screen.

PART 3 - EXECUTION

3.01 PATCHING

- A. Concrete which is not formed as shown on the plans, or for any reason is out of alignment or level or shows a defective surface shall be considered as not conforming with the intent of these specifications and shall be removed from the job by the Contractor, at his expense, unless the Architect grants permission to patch the defective area, which shall be done in accordance with the following procedure. Permission to patch any such area shall not be considered a waiver of the Architect's right to require complete removal of the defective work if the patching does not, in his opinion, satisfactorily restore the quality and appearance of the surface.
- B. When patching is authorized by the Architect, it shall be performed in accordance with the provisions of Paragraph 37, "Patching" of the Architectural Concrete Specifications, published by the Portland Cement Association, current edition.

3.02 FINISHES ON FORMED SURFACE

- A. Upon completion of patching, surfaces of concrete shall be finished as follows:
  - 1. Unexposed concrete shall be left rough.
  - 2. Common Finish:
    - a. Confine common finish to exposed concrete surfaces in mechanical, electrical, and utility spaces, and areas shown or noted in finish schedule.

- b. Strip forms at earliest time permitted by provisions of "Concrete Section". Strip only those forms on areas which can be immediately finished.
  - c. Produce common finish by filling smoothly all the holes and honeycomb areas and knocking off and evening up burrs.
3. Smooth Rubbed Finish:
- a. Provide smooth rubbed finish on vertical interior concrete exposed in the finish work, as indicated on finish schedule not to receive special textured concrete.
  - b. Produce smooth rubbed finish as follows: Mix 1 part Portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having the consistency of thick paint. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout and apply the grout with brushes or a spray gun uniformly, completely filling air bubbles and holes. Immediately after applying the grout, float the surface with a cork or other suitable float, scouring the wall vigorously. While the grout is still plastic, the surface shall be finished with a sponge rubber float removing all excess grout. This finishing shall be done at the time when grout will not be pulled from holes or depressions. Next allow the surface to dry thoroughly, then rub it vigorously with dry burlap to completely remove any dried grout. There shall be no visible film of grout remaining after this rubbing. The entire cleaning operation for any area must be completed the day it is started. No grout shall be left on the wall overnight. After an area has been grout cleaned, if any slightly dark spots or streaks remain they shall be wiped off lightly with a fine abrasive hone without using water but the rubbing with the hone shall not be sufficient to change the texture of the concrete. This final operation shall be included as a part of the smooth rubbed finish.
4. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, parking area slabs, steps and ramps, and elsewhere as indicated. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.03 UNFINISHED STRUCTURAL SLABS

- A. Treat surfaces of structural slabs, not finished as walking surfaces or as support for resilient floor coverings as required by their intended use.
  - 1. Screed surfaces intended to receive cement setting beds for other materials to true planes and scraped free of laitance or scum immediately thereafter, and roughen mechanically for bond as soon as they bear the weight of workmen. Scrub surfaces to receive setting beds before placing setting and broom a thin, neat cement grout onto the surface a short distance ahead of the fill.

3.04 MONOLITHIC CEMENT FINISH

- A. Apply to the surface of concrete floor slabs as follows:
  - 1. Floors scheduled to receive resilient flooring, carpets, and all other floors, stairs, platforms or slabs scheduled or shown on the drawings to have steel troweled cement finish.

2. Screed floor slabs to an even surface by the use of straight edge grade to obtain floor level within specified tolerances after initial deflection under dead load. This means that slab is to be screeded at center span to a rise equal to specified camber of forms, i.e., +/- 0 at columns and + value at center span to attain floor slab level within the specified tolerances after removal of forms. Float concrete with a wood float in a manner which will compact it and produce a surface free from depressions or inequalities of any kind. Floors shall be level with a tolerance of 1/8" in ten feet and shall slope overall no more than 1/4" except where drains occur in which case the floors shall be pitched to the drains as indicated on the drawings. After the concrete has hardened sufficiently to prevent fine materials from working to the top and allowed to stand until all water sheen has disappeared, steel trowel surface. Perform final troweling after the concrete is so hard that no mortar accumulates on the trowel and a ringing sound is produced as the trowel is drawn over the surface. The drying of the surface moisture before troweling must proceed naturally and must not be hastened by the dusting on of dry sand or cement. Perform patching required to bring slabs to specified tolerances using latex or epoxy modified Portland cement.

3.05 SEALER

- A. All interior slabs which serve as the finish floor shall be covered with one coat of liquid sealer compatible with curing compound specified in "Concrete" section. Liquid sealer shall be applied in accordance with the manufacturer's recommendations immediately before releasing the building to the Owner.

END OF SECTION



## SECTION 03 910 - CEMENTITIOUS CONCRETE COATINGS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. All labor and materials for the complete exterior installation of cementitious colored concrete coatings in sidewalk locations as indicated on the drawings.

#### 1.02 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard printed product literature including installation and maintenance instructions.
- C. Shop Drawings: Indicate pattern layout for installation .
- D. Samples: Submit two finish samples, 2 inch x 6 inch in size, illustrating manufacturer's standard color palette and all variations in finish colors and textures.
- E. Manufacturer's Instructions: Indicate in writing all directions for installation.
- F. Maintenance Data: Submit all written recommendations for cleaning and maintaining surfaces.
- G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

#### 1.03 PRE-INSTALLATION MEETING

- A. Two weeks prior to installation and after all approved submittals have been executed, conduct an on-site meeting to review installation procedures and field conditions. Do not begin installation until all conditions for installation are acceptable to the manufacturer.

#### 1.04 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver seating to project site in manufacturer's standard unopened protective wrapping.
- B. Store all materials under cover and elevated above grade.

#### 1.05 PROJECT CONDITIONS

- A. Coordinate seating installation with size, location and installation of service utilities.

#### 1.06 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty for seating and seating components.

### PART 2 PRODUCTS

#### 2.01 BASE BID MANUFACTURER

- A. Cementitious Concrete Coating System
  - 1. Product: Micro-Top.
    - a. Manufacturer: Bomanite Corporation; [www.bomanite.com](http://www.bomanite.com)
    - b. Products:
      - 1) Semi-rigid elastomeric filler: Provide crack filler at all "working" crack and construction joints or as recommended by the manufacturer. Provide approved filler material compatible with adjacent substrate materials.
      - 2) Cementitious coating: Provide manufacturer's standard coating in approved colors.

- 3) Sealer: Provide surface sealer with non-skid additive as recommended by the manufacturer.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Inspect all areas to receive coating system and evaluate requirements for product installation.
  - 1) Test concrete for conformance with ASTM F 1869-98 and/or ASTM E 1907-97.
  - 2) pH level: Concrete shall have a pH level between 7-9.
- B. Correct all defective areas prior to installation of materials.

#### **3.02 INSTALLATION**

- A. Install semi-rigid elastomeric joint materials as recommended by the coating manufacturer.
- B. Concrete Surface Preparation: Follow manufacturer's recommended procedures for abrading surfaces or applying concrete conditioning agents.
- C. Temperature: Maintain minimum 40° F. throughout application and initial 24-hour cure.
- D. Layout: Line off areas to receive color coating. Follow manufacturer's recommendations for edge masking and protection of adjacent surfaces and completed colorations.
- E. Coatings: Apply sequential coatings as recommended by the manufacturer.
  1. Base Coat
  2. Second Coat: 20 mil thickness.
  3. Third Coat: For texture and finish.
- F. After initial curing (10-12 hours) apply water-based acrylic sealer with non-skid additive as recommended by the manufacturer.

#### **3.03 PROTECTION**

- A. Protect completed surfaces until sealed. Do not allow water to stand on surfaces
- B. Clean all visible surfaces after installation s recommended by the manufacturer.
- C. Protect installation from subsequent construction operations.

**END OF SECTION**

## SECTION 04 065 - MORTAR AND MASONRY GROUT

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Mortar for masonry.
- B. Grout for masonry.

#### 1.02 RELATED SECTIONS

- A. Section 04210 - Brick Masonry: Installation of mortar and grout.
- B. Section 04220 - Concrete Unit Masonry: Installation of mortar and grout.

#### 1.03 REFERENCES

- A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements For Masonry Structures; American Concrete Institute International; 1995.
- B. ACI 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; American Concrete Institute International; 1995.
- C. ASTM C 91 - Standard Specification for Masonry Cement; 1997.
- D. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar; 1997.
- E. ASTM C 150 - Standard Specification for Portland Cement; 1997.
- F. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes; 1991 (reapproved 1992).
- G. ASTM C 270 - Standard Specification for Mortar for Unit Masonry; 1997a.
- H. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout; 1997.
- I. ASTM C 476 - Standard Specification for Grout for Masonry; 1995.
- J. ASTM C 780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 1996.
- K. ASTM C 1019 - Standard Test Method of Sampling and Testing Grout; 1989a (Reapproved 1993).
- L. ASTM C 1142 - Standard Specification for Extended Life Mortar for Unit Masonry; 1995.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C 270 is to be used. Also include required environmental conditions and admixture limitations.
- C. Samples: Submit two samples of mortar, illustrating mortar color and color range.
- D. Reports: Submit reports on mortar indicating conformance of mortar to property requirements of ASTM C 270 and test and evaluation reports per ASTM C 780.

- E. Reports: Submit reports on grout indicating conformance of component grout materials to requirements of ASTM C 476 and test and evaluation reports to ASTM C 1019.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Manufacturer's Instructions: Submit packaged dry mortar manufacturer's installation instructions.

**1.05 QUALITY ASSURANCE**

- A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

**1.07 ENVIRONMENTAL REQUIREMENTS**

- A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Masonry Cement: ASTM C 91, Type S, non-staining, 22% maximum air content by volume and proportioned to comply with the requirements of ASTM C270-97 for Type S mortar.
- B. Portland Cement: ASTM C 150 Type I - Normal; natural color.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Pre-mixed, colored masonry cement:
  - 1. Acceptable products; pending compliance with specified characteristics and acceptable color range to match specified color:
    - a. Allied Readymix, RMC Masonry Cement.
    - b. National Cement Company, Coosa Masonry Cement.
    - c. Lehigh Portland Cement Company, Custom Masonry Cement.
    - d. Characteristics: Meeting ASTM C91-97, Type S non-staining, 22% maximum air content by volume, with inert alkali-resistant, fade resistant mineral pigments and complete water-reducing and plasticizing admixtures, proportioned to comply with requirements of ASTM C290-97 for Type S mortar with minimum 28 day compressive strength of 1800 psi for Type S mortar.
    - e. Color: Basis of design is Allied 160 Biltmore Buff as manufactured by Allied Readymix for Type S mortar.
- E. Aggregates:
  - 1. Mortar Aggregate: ASTM C 144. Provide aggregate from single source for colored mortar.
  - 2. Grout Aggregate: See Section 04110 - Cement Grout for Reinforced Masonry.
- F. Water-reducing and Plasticizing Admixtures:
  - 1. Acceptable products:
    - a. Anti-Hydro Co., AHCO WR.
    - b. Chem-Masters Corp., Hydrolox 400.

- c. Sonneborn Building Products, Div. of ChemRex, Inc., Trimix NCA.
- G. Non-shrink Grout:
  - 1. Acceptable products:
    - a. Anti-Hydro, Aexpandcrete-S Hi-Flow.
    - b. Bostik Construction Products, Upcon Super Flow 263.
    - c. Sonneborn Building Products, Sonogrout.
    - d. W.R. Meadows Co., 588.
  - 2. Characteristics: Flowable, non-metallic, controlled expansive grout.
- H. Anchoring Cement for Railings:
  - 1. Acceptable products:
    - a. The Burke Co., Burke Plug.
    - b. W.R. Bonsal Co., Instant Hydraulic Cement.
    - c. Minwax Construction Products Div., Super PorRok.
  - 2. Characteristics: Quick-setting, self-leveling, pourable cement base; waterproof, non-shrinking hydraulic compound.
- I. Water: Clean and potable.

## 2.02 PROPORTIONS

- A. Type S Job-mixed or Bag-mixed Mortar: Proportion materials by volume in accord with ASTM C270-97, and in accordance with one of the following mixes:
  - 1. One part masonry cement to 1/2 part Portland cement to aggregate proportioned at not less than 2-1/4 nor more than three times the volumes of cements used.
  - 2. One part Portland cement and 1/4 to 1/2 part hydrated lime to aggregate proportioned at not less than 2-1/4 nor more than three times the combined volume of cement and lime used.
  - 3. One part pre-mixed Type S masonry cement to aggregate proportioned not less than 2-1/4 nor more than three times the volume of masonry cement used, and as directed by the masonry cement manufacturer for Type S mortar. This method is required for pre-mixed colored masonry cement.
- B. Cement Grout: See Section 04110 - Cement Grout for Reinforced Masonry.
- C. Non-shrink Grout: Mix prepared non-shrink grout product with water as directed by the manufacturer to achieve a compressive strength of 7000 psi at 28 days.
- D. Anchoring Cement for Railings: Mix prepared anchoring cement product data with water as directed by manufacturer for immediate use.

## PART 3 EXECUTION

### 3.01 MIXING:

- A. Mix mortar and cement grout in power-driven, drum type mixers. Operate mixer for 3-5 minutes for mortar and minimum of 5 minutes for grout after addition of all materials.
- B. For job-mixed mortars, add water-reducing and plasticizing admixtures in accordance with manufacturer's product data.
- C. The addition of other admixtures, including chloride-based admixtures and antifreeze ingredients, is not permitted.
- D. Measure materials for job-mixed mortars in a one cubic foot container. Do not measure by shovels.
- E. Add pre-packaged color admixture in accordance with the manufacturer's instructions. Proportion and mix ingredients to produce consistent color throughout work.

- F. Discard grout as follows: (1) if not placed within 1-1/2 hours after water is added to mix, or (2) less than 1-1/2 hours after water is added to mix if recommended by the grout manufacturer.

**3.02 PLACING MORTAR AND GROUT**

- A. Place mortar as directed in Section 04210 - Brick Masonry and Section 04220 - Concrete Unit Masonry.
- B. Re-temper mortar as necessary to keep plastic. Use no mortar after setting has begun or after 2-1/2 hours of initial mixing.
- C. Place anchoring cement and non-shrink grout as specified and as recommended by the manufacturer.

**3.03 MORTAR SCHEDULE**

- A. Mortar for concrete masonry units: Type S.
- B. Mortar for brick masonry units: Type S, colored.

**END OF SECTION**

## SECTION 04 110 - CEMENT GROUT FOR REINFORCED MASONRY

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Grout for masonry.

#### 1.02 RELATED SECTIONS

- A. Section 04210 - Brick Masonry: Installation of mortar and grout.
- B. Section 04220 - Concrete Unit Masonry: Installation of mortar and grout.

#### 1.03 REFERENCES

- A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements For Masonry Structures; American Concrete Institute International; 1995.
- B. ACI 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; American Concrete Institute International; 1995.
- C. ASTM C 150 - Standard Specification for Portland Cement; 1997.
- D. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes; 1991 (reapproved 1992).
- E. ASTM C 270 - Standard Specification for Mortar for Unit Masonry; 1997a.
- F. ASTM C 1142 - Standard Specification for Extended Life Mortar for Unit Masonry; 1995.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Mix Designs: Submit mix designs for each type of cement grout.
- C. Mill Reports: Submit for cement and fine and coarse aggregate for use in cement grout mixes.

#### 1.05 QUALITY ASSURANCE

- A. For each type of cement specified, use only one brand throughout the project.
- B. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials, except aggregate, in original unopened containers displaying product name, type, grade, and mixing instructions.
- B. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Portland Cement: ASTM C 150 Type I - Normal; natural color.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Aggregates:
  - 1. Fine grout: Fine aggregate size #1, in accordance with ASTM C404-95.
  - 2. Coarse grout: Aggregate size #7, in accordance with ASTM C33-93.
- D. Superplasticizing admixture for cement grout:
  - 1. Acceptable products:
    - a. Anti-hydro, A-H Super P.
    - b. Master Builders, Inc., Rheobuild 1000.
    - c. Euclid Chemical Co., Melment L10A Super.
  - 2. Characteristics: Meeting ASTM C494-90, Type F; free of chloride ions.
- E. Water: Clean and potable.

## 2.02 PROPORTIONS

- A. Proportion in accordance with ASTM C476-95, except where more stringent requirements are specified herein.
- B. Fine Grout: Use for grouting where void to be filled has a minimum dimension of 2" or less. Proportion materials by volume to provide minimum 2500 psi compressive strength at 28 days in accordance with ASTM C1019-89a (1993).
- C. Coarse Grout: Use for grouting where void to be filled has a dimension greater than 2". Proportion by volume to provide minimum 2500 psi compressive strength at 28 days in accordance with ASTM C1019-89a(1993).
- D. Provide superplasticizer in all cement grout mixes.

## PART 3 EXECUTION

### 3.01 MIXING

- A. Control batching procedure to ensure volume proportions of grout materials and achieve grout slump between 8" and 11".
- B. Mix grout in accordance with ASTM C94-96.
- C. Measure grout materials mixed at job site by volume and mix ingredients in mechanical mixer for a minimum of five minutes after addition of materials.
- D. Discard grout not placed within 1-1/2 hour after water is added to mix, or sooner if grout begins to set.

### 3.02 PLACING OF GROUT

- A. Place grout as directed in Section 04220 - Concrete Unit Masonry.

**END OF SECTION**

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## SECTION 04 210 - BRICK MASONRY

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Brick Masonry Units.
- B. Reinforcement and Anchorage.
- C. Flashings.
- D. Lintels.
- E. Accessories.

#### 1.02 RELATED SECTIONS

- A. Section 01030 – Bid Alternates: Delete special brick coursing.
- B. Section 04065 - Mortar and Masonry Grout.
- C. Section 04110 - Cement Grout for Reinforced Masonry.
- D. Section 04220 - Concrete Masonry Units.
- E. Section 05500 - Metal Fabrications: Loose steel lintels.
- F. Section 07212 - Board and Batt Insulation: Insulation for cavity spaces and concrete masonry units..
- G. Section 07900 - Joint Sealers: Backing rod and sealant at control and expansion joints.

#### 1.03 REFERENCES

- A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures; American Concrete Institute International; 1995.
- B. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International; 1995.
- C. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 1995a.
- D. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 1995.
- E. ASTM A 641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 1992.
- F. ASTM C 62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale); 1996.
- G. ASTM C 67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 1996.
- H. ASTM C 91 - Standard Specification for Masonry Cement; 1995c.
- I. ASTM C 216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 1995a.

- J. ASTM C 270 - Standard Specification for Mortar for Unit Masonry; 1996a.
- K. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout; 1995.
- L. ASTM C 476 - Standard Specification for Grout for Masonry; 1995.
- M. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 1995.
- N. Brick Institute of America (BIA) - Technical Notes on Brick Construction; Latest Edition.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for brick masonry units, fabricated wire reinforcement, and mortar. Provide manufacturer's application procedures for masonry cleaning compounds.
- C. Samples: Submit five samples of facing brick units to illustrate color, texture, and extremes of color range.
- D. Manufacturer's Certificates:
  - 1. Submit certificates from masonry manufacturer prior to delivery of masonry units to project site. Each certificate shall be signed by an authorized officer of the manufacturing company and shall contain the name and address of the Contractor, the project location, and the quantities and date or dates of shipment or delivery to which the certificate applies.
  - 2. Submit certification from brick manufacturer stating that proposed masonry cleaning compound is suitable for cleaning selected brick, and that masonry cleaning compound will not cause staining nor discoloration of brick.

#### 1.05 QUALITY ASSURANCE

- A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.

#### 1.06 MOCK-UP PANEL

- A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high, which includes mortar and accessories and concrete unit masonry backup. Mock up panel shall correctly demonstrate all brick detailing as indicated in the drawings including but not limited to corbelling, soldier courses, rowlocks and control joints.
- B. Locate mock-up panel where directed by the Architect.
- C. Mock-up panel shall be protected from demolition or damage and shall remain in place until final acceptance of masonry construction.

#### 1.07 PRE-INSTALLATION MEETING

- A. Convene 2 weeks before starting work of this section. Meeting shall be attended by Architect, General Contractor, Subcontractor, and supervising mason.
- B. Review all masonry detailing, project conditions, supervision of trades, coordination of related construction, and continuity of workmanship.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and

contamination by other materials.

#### 1.09 ENVIRONMENTAL REQUIREMENTS

- A. Lay no masonry when temperatures of surrounding air has dropped below 45 degrees F., unless it is rising, and at no time when it has dropped below 40 degrees F., except by written permission from the Architect.
- B. When masonry work is authorized during temperature of below 40 degrees F. but above freezing, provide mortar at temperatures between 70 degrees F. and 100 degrees F.
- C. Maintain air temperature above 40 degrees F. on both sides of masonry for at least 72 hours after laying.

#### 1.10 JOB CONDITIONS

- A. Protection of Work:
  - 1. During erection, at end of each day or shutdown period, keep walls dry by covering with waterproof material, anchored and overhanging each side of wall at least 2'-0".
  - 2. Remove misplaced mortar or grout immediately.
  - 3. Protect face materials against staining.
  - 4. Protect sills, ledges, and offsets from mortar droppings during construction.
- B. Sequencing and Scheduling:
  - 1. Do not cover or enclose mechanical or electrical work requiring inspection until such work has been accepted. Coordinate this work with work of other sections required to be built into masonry construction.

#### 1.11 QUALITY ASSURANCE

- A. Acceptable Tolerances:
  - 1. Maximum variation from plumb:
    - a. In lines and surfaces of walls and arrises:
      - 1) 1/4" in 10'-0".
      - 2) 3/8" in any story or 20'-0" maximum.
      - 3) 1/2" in 40'-0" or more.
    - b. For external corners, expansion joints and other conspicuous lines:
      - 1) 1/4" in any story or 20'-0" maximum.
      - 2) 3/8" in 40'-0" or more.
  - 2. Maximum variation from level or grades for exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines:
    - a. 1/4" in any bay or 20'-0".
    - b. 1/2" in 40'-0" or more.
  - 3. Maximum variation of linear building line from established position in plan and related portions of columns, walls and partitions.
    - a. 1/4" in any bay or 20'-0".
    - b. 3/4" in 40'-0" or more.
  - 4. Maximum variation in cross-sectional dimensions of columns and thickness of walls:
    - a. Not less than 1/4" smaller nor more than 1/2" larger than indicated.

## PART 2 PRODUCTS

### 2.01 BRICK MASONRY UNITS

- A. Facing Brick: ASTM C 216, Type FBS, Grade SW.
  - 1. Brick Type 1: Old Colony
    - a. Manufacturer: Columbus Brick Company
  - 2. Brick Type 2: Buffstone Wirecut.
    - a. Manufacturer: Palmetto Brick Company.
  - 3. Actual size: 3-5/8 inches x 2-1/4 inches x 7-5/8 inches.
  - 4. Special shapes and conditions: Provide molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect. Do not use standard units in any configuration which exposes cores or frogging. Remove and replace any work exposing cored or sawn faces of units to view.
    - a. At ends of soldier and rowlock coursing and corbelling, use only solid brick units.

### 2.02 MORTAR AND GROUT MATERIALS

- A. Mortar and grout: As specified in Section 04065.

### 2.03 REINFORCEMENT AND ANCHORAGE

- A. Joint Reinforcement and Anchorage Materials: Provide materials complying with the following general requirements for joint reinforcement and anchorage devices:
  - 1. Steel Wire: ASTM A 82.
    - a. Hot-dip galvanizing (after fabrication) : ASTM A 153, Class B-2.
    - b. Use: Interior locations.
  - 2. Zinc-coated steel sheet: ASTM A 525 carbon steel, with G90 zinc coating.
    - a. Use: Dovetail slots and similar applications.  
Hot-dip galvanized steel sheet: ASTM A 635 or ASTM A 366; galvanizing in compliance with ASTM A 153 , Class B.
      - a. Use: Anchors and miscellaneous sheet metal in masonry accessories at exterior exposures.
- B. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420) deformed billet bars, except as specifically indicated otherwise; galvanized after fabrication and bending.
  - 1. Bending: Shop fabricate reinforcing bars which are shown to be bent or hooked.
  - 2. Galvanized reinforcing bars: ASTM A 767, Class II, hot-dip galvanized after fabrication and bending
    - a. Cut Bars: Coat sheared ends of all cut galvanized bars with a zinc-rich coating.
- C. Joint Reinforcement: Welded wire units prefabricated into straight lengths not less than 10 feet in length, with deformed continuous side rods and plain cross rods.
  - 1. Widths:
    - a. Width at Brick Masonry Units: Approximately 2 inches less than nominal wall width, providing not less than 5/8 inch mortar coverage on exterior exposures and 1/2 inch elsewhere.
  - 2. Wire sizes:
    - a. Side rod diameter: 0.1483 inch.
    - b. Cross rod diameter: 0.1483 inch.
  - 3. Configuration:
    - a. Applications of single unit width: Truss design, with diagonal cross rods at not more than 16 inches on center.
    - b. Applications greater than one unit width: Truss design, diagonal cross rods at not more than 16 inches on center, and with side rods as follows:
      - 1) One rod per face shell of concrete masonry.
    - c. Corners: Prefabricated L- and T-shaped units.
- D. Single Wythe Joint Reinforcement: Truss type; ASTM A 82 steel wire, hot dip galvanized after fabrication to ASTM A 153/A 153M, Class B; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

- E. Multiple Wythe Joint Reinforcement: Truss type; fabricated with moisture drip; adjustable; ASTM A 82 steel wire, hot dip galvanized after fabrication to ASTM A 153/153M, Class B; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
- F. Bent-Wire Ties: Individual prefabricated units, and as follows:
  - 1. Wire diameter: 0.1875 inch.
  - 2. Length: Adequate to extend 1-1/2 inches minimum into wythes of solid masonry and to provide embedment of 1/2 inch minimum at face shells of hollow masonry, with 5/8 inch of mortar coverage on exterior exposures and 1/2 inch elsewhere.
  - 3. Tie shape at hollow masonry: Rectangular, not less than 2 inches wide.
- G. Brick Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup but preventing lateral movement of masonry out of plane.
  - 1. Anchor plate design: Manufacturer's standard, of not less than 14 gage metal and designed for connection to structural backup through sheathing or insulation by not fewer than 2 fasteners.
    - a. Tie vertical adjustment range: Not less than 2 inches.
  - 2. Tie: Wire type as follows:
    - a. Diameter: 0.1875 inch.
    - b. Shape: Contractor's option.
    - c. Length: Sized to fall no more than 1 inch short of veneer face.
  - 3. Fasteners: Self-drilling, self-tapping, corrosion-resistant screws, as recommended by manufacturer of veneer anchors.
- H. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B-2.

#### 2.04 FLASHINGS

- A. Copper/Kraft Paper Flashings: 1 oz./sq. ft. sheet copper bonded to fiber reinforced asphalt treated Kraft paper.

#### 2.05 ACCESSORIES

- A. Bond Breaker Strips: Building Paper: ASTM D 226, Type I ("No.15") asphalt felt.
- B. Sealant and Backer Rod: As specified in Division 7.
- C. Weepholes:
  - 1. Weephole Ventilators for full head joint installation at grade level.
    - a. Acceptable products:
      - 1) Dur-O-Wal, Cell-Vent D/A 1006.
      - 2) Hohman & Barnard, Inc., QV - Quadro-Vent.
    - b. Characteristics: Flexible ultra-violet resistant polypropylene co-polymer vent with cellular structure. Color as selected by the Architect.
  - 2. Weep Tubes with screens and wicks for all areas other than grade level:
    - a. Medium density polyethelene tubing; outside diameter 3/8 inch, with brass screening at face and twisted synthetic rope wicks inserted in tube and extending minimum 6" at back (cavity) side.
  - 3. Provide pea gravel at lowest weep, as indicated.

#### 2.06 MASONRY CLEANING COMPOUND

- A. Masonry Cleaning Compound:
  - 1. Product Requirements
    - a. Compound shall be certified as acceptable by brick manufacturer, meeting specified requirements, and as recommended by the compound manufacturer for selected brick, to

- ensure that proposed masonry cleaning compound causes no staining or discoloration of brick.
- b. Products shall be specifically formulated for brick type, color, and material content. Product data shall state whether particular compound is acceptable for dark-colored brick, light colored brick, brick subject to non-metallic staining or brick subject to metallic staining.
2. Test Panel: Test each type and dilution of cleaning compound on sample panel.
  3. Formulation: Dilutable formula comprised of inorganic acids, wetting agents and inhibitors.
  4. Characteristics:
    - a. Compound shall be able to cling to masonry for an average dwell period of two minutes, able to loosen mortar residue for complete removal, and shall be water-washable upon completion.
    - b. Compound shall not cause acid burns or streaks.
    - c. Compound shall be able to be applied, based on dilution amount, by using a soft masonry brush or low pressure (40psi-50psi) airless sprayer.

### PART 3 EXECUTION

#### 3.01 GENERAL

- A. Layout: Lay out masonry for accurate pattern bond, for uniform joint widths, and for accurate location of specific features before beginning actual construction. Avoid use of masonry units of less than 1/2 size. Do not use units with less than nominal 4 inch horizontal face dimensions at corners and jambs.
- B. Chases and Recesses: Build masonry to accommodate the work of other trades, including chases and recesses as shown or required. Provide not less than 8 inches of masonry between jambs of openings and chases and recesses.
- C. Openings for Equipment and Services: Leave openings in masonry as required for subsequent installation of equipment and services. Make openings in designated locations and in exact size required, if known; otherwise, leave rough openings in approximate size required and complete masonry work after installation of equipment, matching adjoining masonry.
- D. Structural Framing Anchorage: Anchor masonry to structural framework at points of adjacency, and as follows:
  1. Maintain open space of 1 inch or more between face of framing member and masonry elements.
  2. Fasten anchors to structure and embed in mortar joints as masonry is laid.
  3. Space anchors at maximum of 36 inches on center horizontally and 24 inches on center vertically.
- E. Veneer Anchorage: Anchor masonry veneer to structural backup with anchors specified, and as follows:
  1. Fasten to backup with self-tapping, non-corrosive fasteners as recommended by the manufacturer of anchors for substrate conditions.
  2. Space plates of two-piece anchors so they will be centered on horizontal movement of ties due to differential movement of veneer and backup.
  3. Embed tie sections of two-piece anchors in mortar as masonry is being laid, providing clear air space of at least 2 inches behind veneer wythe.
  4. Space anchors at not more than 1.77 square feet per anchor, nor more than 16 inches on center horizontally and vertically. At openings and ends of veneer panels, provide additional anchors so that maximum spacing at perimeter is 8 inches on center.

#### 3.02 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

#### 3.03 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

### 3.04 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Brick Units:
  - 1. Bond: Running, except where other bonds are indicated at special features.
    - a. Lay concealed masonry in running bond, or laps at least 2 inches
  - 2. Coursing: Three units and three mortar joints to equal 8 inches.
  - 3. Mortar Joints: Concave.

### 3.05 INSTALLATION

- A. Workmanship: Install no brick units that are cracked, broken or chipped in excess of ASTM allowances.
  - 1. Use abrasive power saws to cut brick.
  - 2. Lay brick plumb, true to line and with level courses, spaced within allowable tolerances.
  - 3. Do not furrow joints.
  - 4. Stop-off horizontal run by racking back in each course; toothing is not permitted.
  - 5. Adjust units to final position while mortar is soft and plastic.
  - 6. If units are displaced after mortar has stiffened, remove, clean joints and units of mortar, and relay with fresh mortar.
  - 7. Cutting and patching of finish masonry to accommodate work of other trades shall be done so as not to mar appearance of finished surface.
  - 8. Adjust shelf angles to keep work level and at proper elevation. Provide a 3/8" joint below shelf angle.
  - 9. Mix units from pallets in work to diminish noticeable variation in color and texture between pallets.
  - 10. Provide brick expansion joints with pressure relieving pads continuous under shelf angles.
  - 11. When joining fresh masonry to set or partially set masonry, remove loose brick and mortar, and clean and dampen exposed surface of set masonry prior to laying fresh masonry.
  - 12. Provide solid brick units free of cores or frogs where such characteristics would be exposed in the finished work.
  - 13. Wet brick with initial rate of absorption exceeding 30 grams/30 square inches/ minute when tested in accordance with ASTM C67-97.
  - 14. Cavity walls: Keep cavity clear of mortar and other materials which project into cavity and decrease cavity clearance to less than minimum dimension indicated.
- B. Mortar Beds:
  - 1. Lay brick with full mortar coverage on horizontal and vertical joints in all courses.
  - 2. Provide sufficient mortar on ends of brick to fill head joints.
  - 3. Rock closures into place with head joints thrown against two adjacent bricks in place.
  - 4. Do not pound corners or jambs to fit stretcher units after setting in place.
  - 5. Where adjustment to corners or jambs must be made after mortar has started to set, remove mortar and replace with fresh mortar.
- C. Mortar Joints:
- D. Nominal thickness: 3/8"
- E. Tool joints exposed to finished work when "thumbprint" hard. Joints shall be tooled using jointer at least 2'-0" in length.
- F. Joint profiles:
  - 1. Above or below horizontal recessed courses: Raked.

2. All other joints: Concave.
- G. Trowel point or concave tool joints below grade.
- H. Flush-cut joints not to be exposed in finish work.
- I. As work progresses, trowel protruding mortar fins in cavity flat to inner face of wythe.
- J. Bonding Pattern:
  1. Typical pattern: Running bond.
  2. Other patterns: As indicated on the drawings.
- K. Brick Expansion Joints: Install materials in accordance with recommendations of masonry accessories manufacturer. Joint size shall be same width as mortar joints.
  1. Space pressure-relieving pads at expansion joints indicated on the drawings.
  2. Coordinate location of expansion joints in brick work with control joints in concrete unit masonry backup.
- L. Building Expansion Joints: Keep clean of mortar and debris. Make joints width as indicated. Stop horizontal joint reinforcement 1" each side of joint. Caulk or seal in accordance with Section 07900 - Joint Sealers.
- M. Flashing:
  1. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
    - a. Clean surface of masonry smooth and free from projections which might puncture flashing material.
    - b. Extend flashings full width at such interruptions and at least 6 inches into adjacent masonry or turn up at least 4 inches to form watertight pan at non-masonry construction.
    - c. Remove or cover protrusions or sharp edges that could puncture flashings.
    - d. Seal lapped ends and penetrations of flashing before covering with mortar.
    - e. Extend metal flashings through exterior face of masonry and turn down to form drip.
    - f. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.
    - g. Place flashings on sloped mortar bed; seal lapped ends and penetrations of flashing before covering with mortar.
      - 1) Extend metal flashings through exterior face of masonry and turn down to form drip.
    - h. Veneer Flashings: Turn flashings up not less than 4 inches at backup. Lap top of flashing with building paper, or otherwise seal to prevent moisture penetration between flashing and backup.
    - i. Heads and Sills: Turn up ends of flashing at least 2 inches at heads and sills to form a pan, and seal joints.
    - j. Sealing: Seal all joints in flashing to ensure watertight integrity.
      - 1) Lap end joints on nondeformed metal flashings at least 4 inches; seal laps with elastic sealant or mastic.
- N. Weepholes:
  1. Provide weepholes in exterior wythe of masonry at 2'-0" o.c. horizontally at heads and sills of openings, in exterior walls at grade and in other locations where flashing is indicated.
  2. Weephole ventilators:
    - a. Provide weephole ventilators at grade level.
    - b. Install weephole ventilator in open head joint, flush with low edge of adjacent brick.
    - c. Install pea gravel fill in cavity behind ventilators. Install continuously at grade.
  3. Install weep tubes at all weepholes except at grade level where weephole ventilators are installed. Install weep tubes at bottom of head joint with screening to exterior; lay extra length of wick horizontally in cavity.
  4. Keep weepholes and area above flashing free of mortar droppings.
- O. Sealant Joints: Retain 1/2" wide sealant joint around outside perimeter of exterior doors, window frames

and other wall openings.

- P. Pointing: Cut out defective mortar joints and holes in exposed work. Repoint with new mortar.
- Q. Dry Cleaning: Brush brick surfaces with stiff bristle brush. Do not allow mortar droppings to harden on exposed surfaces.

### 3.06 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. General: Before placing metal masonry accessories, remove loose rust, dirt, and other non-conforming coatings
- B. Corbelled walls:
  - 1. Install veneer wall ties to masonry backup at 8 inches on center vertically
  - 2. Use only solid clay units at corbelled masonry construction
- C. Install horizontal joint reinforcement 16 inches on center.
- D. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- E. Place continuous joint reinforcement in first and second joint below top of walls.
- F. Lap joint reinforcement ends minimum 6 inches.
- G. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 36 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 on center.
- H. Masonry Back-Up: Embed anchors in masonry back-up to bond veneer at maximum 1.77 sq ft of wall surface per anchor. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 on center.
- I. Reinforce joint corners and intersections with strap anchors 16 inches on center.

### 3.07 REINFORCEMENT AND ANCHORAGES - CAVITY WALL MASONRY

- A. General: Before placing metal masonry accessories, remove loose rust, dirt, and other non-conforming coatings
- B. Install horizontal joint reinforcement 16 inches on center.
- C. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of openings.
- D. Place continuous joint reinforcement in first and second joint below top of walls.
- E. Lap joint reinforcement ends minimum 6 inches.
- F. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Space anchors at maximum of 24 inches horizontally and 24 inches vertically.
- G. Reinforce joint corners and intersections with strap anchors 16 inches on center.

### 3.08 LINTELS

- A. Install loose steel lintels over openings.

- B. Maintain minimum 8 inch bearing on each side of opening.

### 3.09 GROUTED COMPONENTS

- A. Grouting Technique: Perform all grouting by means of low-lift technique; do not use high lift grouting.
  - 1. Do not exceed 12 inches in height for grout pours.
- B. Lap splices minimum 24 bar diameters.
- C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- D. Place and consolidate grout fill without displacing reinforcing.
- E. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

### 3.10 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames, fabricated metal frames, anchor bolts, and plates and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
  - 1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

**3.11 CLEANING**

- A. At least 21 days prior to application of specified cleaning solution to brick work, apply solution on half of the surface of the sample panel. Should discoloration of brick or mortar joints, staining or efflorescence appear on sample panel, notify the Architect for further instructions before proceeding with final surface cleaning.
- B. No wet cleaning shall take place within seven days of placing masonry.
- C. Apply manufactured cleaning compound on brick masonry as tested on sample panel in accordance with manufacturer's product data. Flush with clean water.
- D. At least two hours prior to application of cleaning solution to brick work, saturate mortar joints with clean water and brush off loose debris.
- E. Begin cleaning operation at highest point of wall, working downward in areas of 20 S.F. maximum. As cleaning progresses, flush wall to prevent accumulation of loosened residues. Do not allow wetted walls below level of cleaning to dry and leave previously diluted residues from cleaning.
- F. Safely discard solutions containing debris and residue.
- G. Do not scrub mortar joints with cleaning solution.
- H. Do not use high pressure water streams to clean any brick surfaces.
- I. Protect materials adjacent to brick work which are subject to corrosion from contact with cleaning solution.
- J. Remove stains in accordance with recommendations of the Brick Institute of America, Technical Notes #20, 1990 edition. Use cleaning agents only after pretesting on sample panel.

**3.12 PROTECTION OF FINISHED WORK**

- A. Without damaging completed work, provide protective boards at exposed external corners which are subject to damage by construction activities.
- B. Institute other protective measures as necessary to ensure that unit masonry work will be clean, free of staining from adjacent soils, and undamaged at substantial completion. Reclean any brick work soiled or stained after initial cleaning and prior to Substantial Completion.

**END OF SECTION**



## SECTION 04 220 - CONCRETE UNIT MASONRY

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Work of this section includes providing concrete masonry units and building in the work of other trades.
- B. Work installed but furnished under other sections:
  - 1. Metal door frame anchors.

#### 1.02 RELATED SECTIONS

- A. Section 07150 - Dampproofing.
- B. Section 07212 - Board and Batt Insulation: Insulation for cavity spaces.
- C. Section 07900 - Joint Sealers: Backing rod and sealant at control and expansion joints.

#### 1.03 REFERENCES

- A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures; American Concrete Institute International; 1995.
- B. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International; 1995.
- C. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 1995a.
- D. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 1995.
- E. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 1996a.
- F. ASTM A 641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 1992.
- G. ASTM C 55 - Standard Specification for Concrete Brick; 1996a.
- H. ASTM C 90 - Standard Specification for Load-Bearing Concrete Masonry Units; 1996a.
- I. ASTM C 91 - Standard Specification for Masonry Cement; 1995c.
- J. ASTM C 129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 1996a.
- K. ASTM C 140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units; 1996b.
- L. ASTM C 270 - Standard Specification for Mortar for Unit Masonry; 1996a.
- M. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout; 1995.
- N. ASTM C 476 - Standard Specification for Grout for Masonry; 1995.
- O. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 1995.

- P. Portland Cement Association (PCA) - Concrete Masonry Handbook, latest edition.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and mortar.
- C. Manufacturer's Certificates:
  - 1. Submit certificates from masonry manufacturer prior to delivery of concrete masonry units to project site. Each certificate shall be signed by an authorized officer of the manufacturing company and shall contain the name and address of the Contractor, the project location, and the quantities and date or dates of shipment or delivery to which the certificate applies.
  - 2. Units shall be certified for compliance with specification requirements, including compressive strength, moisture content, and linear drying shrinkage.
  - 3. Time-rated, fire resistant masonry units shall be certified by manufacturer to comply with mix design and equivalent thickness requirements of Underwriters' Laboratories, Inc (U.L.) for time ratings indicated. Certification shall include evidence of manufacturer's qualification to manufacture fire-rated units.

#### 1.05 QUALITY ASSURANCE

- A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.
- B. Allowable Tolerances:
  - 1. Maximum variation from plumb: 1/4" in 10'-0"; not exceeding 3/8" in 20'-0".
  - 2. Maximum variation from level: 1/4" in 20'-0"; not exceeding 1/2" in 40'-0" or more.
  - 3. Maximum variation in linear building line from location indicated: 1/2" in 20'-0".

#### 1.06 MOCK-UP PANEL

- A. Construct a masonry wall as part of the brick mock-up panel. See Section 04210 - Brick Unit Masonry for related items to be installed and coordinated.
- B. Locate mock-up panel where directed by the Architect.
- C. Mock-up panel shall remain in place until final acceptance of masonry construction.

#### 1.07 PRE-INSTALLATION MEETING

- A. Convene 2 weeks before starting work of this section. Meeting shall be attended by Architect, General Contractor, Subcontractor, and supervising mason.
- B. Review all masonry detailing, project conditions, supervision of trades, coordination of related construction, and continuity of workmanship.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
- B. Keep units dry. Allow air circulation around stacked units. Wet concrete masonry units shall not be installed.

#### 1.09 JOB CONDITIONS

- A. Environmental Requirements:
  - 1. Lay no masonry units when temperature of surrounding air has dropped below 45 degrees F., unless it is rising, and at no time when it has dropped below 40 degrees F., unless authorized in writing by the Architect.
  - 2. When masonry work is authorized at temperatures below 40 degree F., but above freezing, provide mortar at temperature between 70 degrees F. and 100 degrees F. Maintain air temperature above 40 degrees F. on both sides of masonry for 72 hours after laying.
  - 3. Protect masonry construction from direct exposure to wind and sun when erected in ambient air temperatures of 95 degrees in the shade and 50% humidity.
- B. Protection of Work:
  - 1. Keep walls dry during erection by covering at end of each work period with a waterproof membrane. Protect partially completed walls not under construction in a similar manner. Covering shall overhang at least 2'-0" on each side of wall and shall be anchored on each side of wall.
  - 2. Protect finish exposed work from staining.
  - 3. Allow mortar droppings sticking to the unit face to dry, then remove with a trowel and lightly brush the wall surface with a bristled brush.

## PART 2 PRODUCTS

### 2.01 CONCRETE MASONRY UNITS

- A. Manufacturer: Blue Circle Williams
  - 1. Substitutions: See Section 01600 for substitution requirements.
- B. Concrete Masonry Units: Comply with referenced standards and as follows:
  - 1. Size: Standard units with nominal face dimensions of 16 x 4 (actual 15-5/8 inches x 3-5/8 inches), 16 x 8 inches (actual 15-5/8 inches x 7-5/8 inches), 16 x 12 (actual 15-5/8 inches x 7-5/8 inches), and nominal depths as indicated on the drawings for specific locations.
  - 2. Special Shapes: Provide non-standard blocks configured for corners, lintels, headers, control joint edges, and other detailed conditions, whether or not specifically indicated on the drawings as special.
  - 3. Outside Corners: Provide rounded or bull-nosed units.
  - 4. Fire Ratings: Provide fire rated units at locations where indicated on the drawings.
  - 5. Non-Loadbearing Units: ASTM C 129.
    - a. Hollow block, as indicated.
    - b. Type I: Moisture-controlled; lightweight.
- C. Concrete Brick: ASTM C 55.
  - 1. Grade N, Type I, lightweight.
  - 2. Size: As indicated on drawings.
  - 3. Special Shapes: Provide non-standard brick configured for corners.
- D. Fire Ratings: Provide fire rated units at locations where indicated on the drawings.

### 2.02 REINFORCEMENT AND ANCHORAGE

- A. Joint Reinforcement and Anchorage Materials: Provide materials complying with the following general requirements for joint reinforcement and anchorage devices:
  - 1. Steel Wire: ASTM A 82.
    - a. Hot-dip galvanizing (after fabrication) : ASTM A 153, Class B-2.
    - b. Use: Interior locations.
  - 2. Zinc-coated steel sheet: ASTM A 525 carbon steel, with G90 zinc coating.
    - a. Use: Dovetail slots and similar applications.
  - 3. Hot-dip galvanized steel sheet: ASTM A 635 or ASTM A 366; galvanizing in compliance with ASTM A 153 , Class B.

- a. Use: Anchors and miscellaneous sheet metal in masonry accessories at exterior exposures.
- B. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420) deformed billet bars, except as specifically indicated otherwise; galvanized after fabrication and bending.
  - 1. Bending: Shop fabricate reinforcing bars which are shown to be bent or hooked.
  - 2. Galvanized reinforcing bars: ASTM A 767, Class II, hot-dip galvanized after fabrication and bending
    - a. Cut Bars: Coat sheared ends of all cut galvanized bars with a zinc-rich coating.
- C. Joint Reinforcement: Welded wire units prefabricated into straight lengths not less than 10 feet in length, with deformed continuous side rods and plain cross rods.
  - 1. Widths:
    - a. Width at Concrete Masonry Units: Approximately 1-1/2 inches less than nominal wall width. Provide not less than 1/2 inch mortar coverage on each exposure.
    - b. Width at Brick Masonry Units: Approximately 2 inches less than nominal wall width, providing not less than 5/8 inch mortar coverage on exterior exposures and 1/2 inch elsewhere.
  - 2. Wire sizes:
    - a. Side rod diameter: 0.1483 inch.
    - b. Cross rod diameter: 0.1483 inch.
  - 3. Configuration:
    - a. Applications of single unit width: Truss design, with diagonal cross rods at not more than 16 inches on center.
    - b. Applications greater than one unit width: Truss design, diagonal cross rods at not more than 16 inches on center, and with side rods as follows:
      - 1) One rod per face shell of concrete masonry.
    - c. Corners: Prefabricated L- and T-shaped units.
- D. Single Wythe Joint Reinforcement: Truss type; ASTM A 82 steel wire, hot dip galvanized after fabrication to ASTM A 153/A 153M, Class B; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
- E. Multiple Wythe Joint Reinforcement: Truss type; fabricated with moisture drip; adjustable; ASTM A 82 steel wire, hot dip galvanized after fabrication to ASTM A 153/153M, Class B; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
- F. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and structural frame but preventing lateral movement of masonry out of plane.
- G. Bent-Wire Ties: Individual prefabricated units, and as follows:
  - 1. Wire diameter: 0.1875 inch.
  - 2. Length: Adequate to extend 1-1/2 inches minimum into wythes of solid masonry and to provide embedment of 1/2 inch minimum at face shells of hollow masonry, with 5/8 inch of mortar coverage on exterior exposures and 1/2 inch elsewhere.
  - 3. Tie shape at hollow masonry: Rectangular, not less than 2 inches wide.

### 2.03 HIGH STRENGTH PRECAST AND PRESTRESSED LINTELS

- A. General: High strength precast and prestressed lintels are acceptable alternates to masonry lintels. Coordinate composite structural requirements as recommended by the lintel manufacturer for use with concrete masonry units over indicated openings.
- B. Acceptable manufacturers:
  - 1. Basis of Design: Cast-Crete, A Division of Florida Engineered Construction Products Corporation; High Strength Precast & Prestressed Concrete Lintels & Sills.
- C. Design Characteristics:
  - 1. Precast Lintels: Working Stress  $f'c$  for 8" members - 3500psi.
  - 2. Prestressed Lintels: Working Stress  $f'c$  for 6" and 12" members - 6000psi.
  - 3. Grout: Working Stress  $f'c$  - 3000 psi with maximum 3/8" aggregate.
  - 4. Composite CMU: In accordance with ASTM C90 with minimum net area compressive strength of 1900psi.
  - 5. Reinforcing Steel: ASTM A615 Grade 60.
  - 6. Prestressing Strands: ASTM A416 Grade 270 low relaxation. 7/32 wire in accordance with ASTM A510.
  - 7. Composite Mortar: In accordance with ASTM C270, Type M or S.

### 2.04 ACCESSORIES

- A. Preformed Control Joints at Concrete Masonry Units: Styrene-butadiene rubber compound (ASTM D 2000); designation 2AA-805 material. Provide with corner and tee accessories, fused joints. Size for standard sash block and to allow movement while maintaining lateral stability.
- B. Bond Breaker Strips: Building Paper: ASTM D 226, Type I ("No.15") asphalt felt.
- C. Sealant and Backer Rod: As specified in Division 7.
- D. Masonry Cleaning Compound:
  - 1. Product Requirements
    - a. Compound shall be certified as acceptable by masonry manufacturer, meeting specified requirements, and as recommended by the compound manufacturer for selected brick, to ensure that proposed masonry cleaning compound causes no staining or discoloration of brick.
    - b. Products shall be specifically formulated for masonry type, color, and material content. Product data shall state whether particular compound is acceptable for dark colored brick, light colored brick, brick subject to non-metallic staining or brick subject to metallic staining.
  - 2. Test Panel: Test each type and dilution of cleaning compound on sample panel.
  - 3. Formulation: Dilutable formula comprised of inorganic acids, wetting agents and inhibitors.
  - 4. Characteristics:
    - a. Compound shall be able to cling to masonry for an average dwell period of two minutes, able to loosen mortar residue for complete removal, and shall be water-washable upon completion.
    - b. Compound shall not cause acid burns or streaks.
    - c. Compound shall be able to be applied, based on dilution amount, by using a soft masonry brush or low pressure (40psi-50psi) airless sprayer.

### 2.05 MORTAR AND GROUT

- A. Mortar and grout: See Section 04065 - Mortar and Grout and Section 04100 - Cement Grout for Reinforced Masonry.
- B. Grout: ASTM C 476. Consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

### PART 3 EXECUTION

#### 3.01 GENERAL

- A. Layout: Lay out masonry for accurate pattern bond, for uniform joint widths, and for accurate location of specific features before beginning actual construction. Avoid use of masonry units of less than 1/2 size. Do not use units with less than nominal 4 inch horizontal face dimensions at corners and jambs.
- B. Chases and Recesses: Build masonry to accommodate the work of other trades, including chases and recesses as shown or required. Provide not less than 8 inches of masonry between jambs of openings and chases and recesses.
- C. Openings for Equipment and Services: Leave openings in masonry as required for subsequent installation of equipment and services. Make openings in designated locations and in exact size required, if known; otherwise, leave rough openings in approximate size required and complete masonry work after installation of equipment, matching adjoining masonry.
- D. Structural Framing Anchorage: Anchor masonry to structural framework at points of adjacency, and as follows:
  - 1. Maintain open space of 1 inch or more between face of framing member and masonry elements.
  - 2. Fasten anchors to structure and embed in mortar joints as masonry is laid.
  - 3. Space anchors at maximum of 36 inches on center horizontally and 24 inches on center vertically.

#### 3.02 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

#### 3.03 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

#### 3.04 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Interior Wall Coursing and Outside Corners: Provide bull-nosed units at outside corners of walls. Begin wall construction with a nominal 4 inch square concrete brick and lay up 8 inch bullnosed units on subsequent courses.
- C. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- D. Concrete Masonry Units:
  - 1. Bond: Running.
  - 2. Coursing: One unit and one mortar joint to equal 8 inches.
  - 3. Mortar Joints: Concave.

#### 3.05 PLACING AND BONDING

- A. Concrete Masonry Units: Do not wet concrete masonry units prior to laying.

- B. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- C. Lay hollow masonry units with face shell bedding on head and bed joints.
  - 1. Install concrete masonry unit insulation in accordance with manufacturer's recommendations.
- D. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- E. Remove excess mortar as work progresses. Keep cavities clear of mortar droppings and strike flush mortar joints facing cavity.
- F. Interlock intersections and external corners.
- G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- I. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.
- J. Isolate masonry partitions from vertical structural framing members with a control joint or as indicated.
- K. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with sealant and backer rod.
- L. Stopping Work: Lay masonry in proper sequence to avoid toothing. Rack walls back in each course at end of each work day. Before resuming, clean exposed surfaces and remove loose masonry units and mortar.
  - 1. Lightly wet previously laid clay masonry units which have a rate of absorption of more than 1 gram per square inch per minute (ASTM C 67), before laying fresh masonry.

**3.06 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY**

- A. General: Before placing metal masonry accessories, remove loose rust, dirt, and other non-conforming coatings
- B. Install horizontal joint reinforcement 8 inches on center.
- C. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- D. Place continuous joint reinforcement in first and second joint below top of walls.
- E. Lap joint reinforcement ends minimum 6 inches.
- F. Reinforce joint corners and intersections with strap anchors 16 inches on center.
- G. Do not span movement joints with reinforcement.

**3.07 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER**

- A. General: Before placing metal masonry accessories, remove loose rust, dirt, and other non-conforming coatings
- B. Corbelled walls:
  - 1. Install veneer wall ties to masonry backup at 8 inches on center vertically

2. Use only solid clay units at corbelled masonry construction
- C. Install horizontal joint reinforcement 16 inches on center.
- 0D. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- E. Place continuous joint reinforcement in first and second joint below top of walls.
- F. Lap joint reinforcement ends minimum 6 inches.
- G. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 36 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 on center.
- H. Masonry Back-Up: Embed anchors in masonry back-up to bond veneer at maximum 1.77 sq ft of wall surface per anchor. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 on center.
- I. Reinforce joint corners and intersections with strap anchors 16 inches on center.

### 3.08 REINFORCEMENT AND ANCHORAGES - CAVITY WALL MASONRY

- A. General: Before placing metal masonry accessories, remove loose rust, dirt, and other non-conforming coatings
- B. Install horizontal joint reinforcement 16 inches on center.
- C. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of openings.
- D. Place continuous joint reinforcement in first and second joint below top of walls.
- E. Lap joint reinforcement ends minimum 6 inches.
- F. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Space anchors at maximum of 24 inches horizontally and 24 inches vertically.
- G. Reinforce joint corners and intersections with strap anchors 16 inches on center.

### 3.09 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
  1. Extend flashings full width at such interruptions and at least 6 inches into adjacent masonry or turn up at least 4 inches to form watertight pan at non-masonry construction.
  2. Remove or cover protrusions or sharp edges that could puncture flashings.
  3. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Extend metal flashings through exterior face of masonry and turn down to form drip.
- C. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.
- D. Place flashings on sloped mortar bed; seal lapped ends and penetrations of flashing before covering with mortar.
  1. Extend metal flashings through exterior face of masonry and turn down to form drip.

- E. Veneer Flashings: Turn flashings up not less than 4 inches at backup. Lap top of flashing with building paper, or otherwise seal to prevent moisture penetration between flashing and backup.
- F. Heads and Sills: Turn up ends of flashing at least 2 inches at heads and sills to form a pan, and seal joints.
- G. Sealing: Seal all joints in flashing to ensure watertight integrity.
  - 1. Lap end joints on nondeformed metal flashings at least 4 inches; seal laps with elastic sealant or mastic.

### 3.10 LINTELS

- A. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
  - 1. Openings to 42 inches: Place two, No. 3 reinforcing bars 1 inch from bottom web.
  - 2. Openings from 42 inches to 78 inches: Place two, No. 5 reinforcing bars 1 inch from bottom web.
  - 3. Openings over 78 inches: Reinforce openings as detailed.
  - 4. Do not splice reinforcing bars.
  - 5. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
  - 6. Place and consolidate grout fill without displacing reinforcing.
  - 7. Allow masonry lintels to attain specified strength before removing temporary supports.
  - 8. Contractor's option: Install precast or prestressed lintels as specified and as recommended by the lintel manufacturer.
- B. Maintain minimum 8 inch bearing on each side of opening.

### 3.11 GROUTED COMPONENTS

- A. Grouting Technique: Perform all grouting by means of low-lift technique; do not use high lift grouting.
  - 1. Do not exceed 12 inches in height for grout pours.
- B. Lap splices minimum 24 bar diameters.
- C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- D. Place and consolidate grout fill without displacing reinforcing.
- E. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

### 3.12 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control and expansion joints.
- B. Build in movement joints where indicated or recommended by the Brick Institute of America Technical Notes on Construction No.18A , installing accessory items as masonry is constructed.
- C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- D. Size control joint in accordance with Section 07900 for sealant performance.
- E. Form expansion joint as detailed.

### 3.13 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames, fabricated metal frames, anchor bolts, and plates and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
  - 1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

#### 3.14 CUTTING AND FITTING

- A. Where cutting is required, use power saws to provide clean, sharp, unchipped edges.
- B. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.
- C. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.
- D. Remove and replace masonry where appearance is unacceptable.

#### 3.15 REPAIRING MASONRY

- A. Replacement: Carefully remove areas of damaged masonry and replace with matching, undamaged units using mortar which matches original work.
- B. Pointing: As joints are tooled, remove mortar with visible holes or mortar which cannot be compacted properly because of hidden voids, and replace with fresh mortar, filling each joint completely and tooling to match adjacent work.

#### 3.16 CLEANING

- A. Clean concrete masonry units as follows and as directed by the concrete masonry unit manufacturer:
  - 1. Clean masonry after mortar is thoroughly set and cured.
  - 2. Scrape off adhered mortar particles by hand, using non-metallic tools.
  - 3. Comply with directions of concrete unit masonry manufacturer and NCMA Tek Bulletin No. 45 for cleaning CMU.
- B. Remove excess mortar and mortar smears on clay masonry as work progresses.
- C. Replace defective mortar. Match adjacent work.
- D. Clean soiled surfaces with cleaning solution and as recommended by the material manufacturer for the surface to be cleaned.
- E. Use non-metallic tools in cleaning operations.

#### 3.17 PROTECTION OF FINISHED WORK

- A. Without damaging completed work, provide protective boards at exposed external corners which are subject to damage by construction activities.
- B. Institute other protective measures as necessary to ensure that unit masonry work will be clean, free of staining from adjacent soils, and undamaged at substantial completion.

**END OF SECTION**

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## SECTION 04 230 - REINFORCED MASONRY

### PART 1 - GENERAL

#### 1.01 CROSS REFERENCE:

- A. Except as modified herein, Masonry Specification Section 04220 & 04080 shall apply.

#### 1.02 REFERENCE STANDARDS:

- A. Southern Standard Building Code.
- B. "Specification for the Design and Construction of Load Bearing Concrete Masonry" published by National Concrete Masonry Association.
- C. ACI 530-99, "Building Code for Masonry Structures."
- D. ACI 530.1-99, "Specifications for Masonry Structures."

#### 1.03 BRACING:

Forming and shoring of reinforced masonry bearing walls, shall be provided during the course of construction, until all permanent elements have been installed.

#### 1.04 COORDINATE PLACEMENT:

Coordinate work of other trades.

### PART 2 - PRODUCTS

#### 2.01 CONCRETE MASONRY UNITS:

Hollow load bearing masonry units shall be Grade N, Type I, Moisture Controlled, conforming to ASTM C90-85. Compressive strengths may be determined by one of the following methods and minimum specified strengths of either method will be acceptable.

- A. Acceptance of concrete masonry units may be determined by preliminary prism tests. A minimum of 15 prisms must be tested and the minimum acceptable  $f'_m=1500$  must be met as an average of these prisms. Not more than 4 prisms may have an ultimate strength less than  $f'_m=1500$  psi. All prisms must be constructed using materials which will be used during construction. Prism construction and testing must be performed in compliance with "Specification for the Design and Construction at Load-Bearing Concrete Masonry" and "NCMA TEK 22" published by National Concrete Masonry Association, or with ACI 530.1.
- B. Low pressure steam cured masonry units shall have been yard cured for not less than 27 additional days when placed in the structure and shall have a compressive strength of 2000 psi based on the net area.
- C. Autoclave concrete masonry units shall be cured in high pressure saturated steam at a minimum

temperature of 350 degrees F. for a period of not less than 48 hours prior to being placed in the structure. They shall have a compressive strength of 2500 psi based on the net area.

- D. Carbonated concrete masonry units shall be subjected to a complete cycle of carbonation following normal low pressure curing. They may be placed in the structure at a minimum age of 7 days provided the linear shrinkage when determined by ASTM C426 is not greater than .035% and shall have a compressive strength of 2500 psi based on the net area.

#### 2.02 MORTAR & GROUT:

For load bearing masonry walls shall conform to ASTM C476, "Standard Specification for Grout for Masonry."

- A. Grout for pumping shall have not less than seven sacks of cement in each cubic yard of grout. Design mix shall be approved by the Architect.
- B. Grout shall be fluid consistency, which means that consistency be as fluid as possible for pouring without segregation of the constituent parts. The use of admixtures shall not be permitted in mortar containing more than 10% lime by volume. Proportions of admixture shall be as approved by the Architect.
- C. The use of uncontrolled fire clay, dirt, and other deleterious materials is prohibited.

#### 2.03 REINFORCING:

- A. Reinforcing bars shall conform to ASTM A615 Grade 60.
- B. Horizontal joint reinforcement: (use for all reinforcing except as noted).
  - 1. Type: Full welded factory formed flat steel wire units, ladder design, with deformed side rods and plain cross rods (16 inch o/c maximum). Corners and tees shall be factory formed. Lapping of corners will not be acceptable.
  - 2. Size: Center to center of longitudinal wires shall allow for positioning within two inches from faces of solid masonry units and in center of the face shells of hollow masonry units. Reinforcement shall be provided in standard lengths 10 to 20 feet long.
  - 3. Finish: Mill galvanized in accordance with ASTM A116, Class 3, 0.80 ounces per square foot minimum.
  - 4. Wire gauge: No. 9 for side and cross rods conforming to ASTM-A82.
  - 5. Acceptable manufacturer: "Dur-O-Wal Ladur" by Dur-O-Wal Products, Inc.
- C. Adjustable Weld-On Anchors (for connecting built-in steel columns to adjacent masonry wall). Round (1/4-inch diameter) or flat (12 gage x 3/4" wide) intermittent or continuous adjustable weld-on anchors, with 4-inch adjustment and 3/8-inch offset, at 16-inches o.c. maximum, to be welded to steel column in accordance with manufacturer's recommendations, or 3/16" fillet weld x 1-1/2" long each side at each end of each offset. Anchors shall be supplied in manufacturer's standard lengths, and shall be hot dip galvanized.
- D. Triangle Ties (for use with adjustable weld-on anchors). Ties shall be 3/16-inch diameter minimum, with

7-inch minimum length, and shall be hot dip galvanized. Ties shall be spaced at 16-inches on center. Space between masonry and steel column shall be grouted solid with 2000 psi minimum grout.

- E. Reinforcing shall be clean and free from loose rust scale and any coatings that reduce bond.

**PART 3 - EXECUTION**

**3.01 WORKMANSHIP:**

- A. Masonry work shall not be started when the horizontal or vertical alignment of the foundation is a maximum of one inch total in error.
- B. Masonry shall be laid true, level, plumb, and neatly in accordance with the plans.
- C. Units shall be cut accurately to fit plumbing ducts, openings and electrical work, and all holes shall be neatly patched.
- D. No construction supports shall be attached to the wall except where specifically permitted by the Architect.

**3.02 MASONRY UNITS:**

- A. Masonry units shall be sound, dry, clean, and free from cracks when placed in the structure.
- B. Masonry units shall be stored on the job so that they are kept off the ground and protected from rain. Wetting the units shall not be permitted except when hot dry weather exists causing the units to be warm to the touch, and then the surface only may be wetted with a light fog spray.
- C. Proper masonry units shall be used to provide for all windows, doors, bond beams, lintels and pilasters, with a minimum of unit cutting. Lintels as scheduled on drawings shall be finished to match unit masonry.
- D. Where masonry unit cutting is necessary, all cuts shall be neat and true.

**3.03 BONDING:**

- A. For bonding the masonry to the foundation the top surface of the concrete foundation shall be clean, with laitance removed and aggregate exposed before starting the masonry construction.
- B. Bond pattern shall be as shown on the drawings.
- C. Intersecting masonry walls and partitions shall be bonded by the use of steel ties at 16 inches o.c. maximum.

**3.04 JOINTS:**

- A. The starting joint on foundations shall be laid with full mortar coverage on the bed except that the area where grout occurs shall be kept free from mortar so that the grout will contact the foundations.
- B. Mortar joints shall be straight, clean, and uniform in thickness and shall be tooled as shown on the plans.

- C. Walls shall have joints tooled with a round bar to product a dense, slightly concave surface well bonded to the block at the edges, unless specifically detailed otherwise.
- D. Tooling shall be done when the mortar is partially set but still sufficiently plastic to bond. All tooling shall be done with a tool which compacts the mortar, pressing the excess mortar out of the joint rather than dragging it out.
- E. Joints which are not tight at the time of tooling shall be raked out.
- F. Unless otherwise specified or detailed on the plans, in hollow unit masonry the horizontal and vertical mortar joints shall be 3/8" thick with full mortar coverage on the face shells and on the webs.
- G. Vertical head joints shall be buttered well for a thickness equal to the face shell of the unit and these joints shall be shoved tightly so that the mortar bonds well to both units. Joints shall be solidly filled from the face of the block to at least the depth of the face shell.
- H. If it is necessary to move a unit after it has been once set in place, the unit shall be removed from the wall, cleaned and set in fresh mortar.
- I. Lintels, capping units and all bearing plates set by the mason shall be set in a full bed of mortar.

3.05 TOLERANCES:

For concrete masonry construction based on actual dimensions.

- A. Variation from the Plumb
  - 1. In the lines and surface of columns, walls and arises: in 10 feet - 1/4 inch; in any story or 20 feet maximum - 3/8 inch; in 40 feet of more - 1/2 inch.
  - 2. For external corners, control joints and other conspicuous lines: in any story or 20 feet maximum 1/4 inch; in 40 feet or more - 1/2 inch.
- B. Variation from the level or the grades indicated on the drawings:
  - 1. For exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines; in any bay or 20 feet maximum - 1/4 inch; in 40 feet or more - 1/2 inch.
- C. Variation of the linear Building Lines from Established Position in Plan and Related Portion of Columns, Walls and Partitions.
  - 1. In any bay or 20 feet maximum - 1/2 inch; in 40 feet or more - 3/4 inch.
- D. Variation in Cross-Sectional Dimensions of Columns and in the Thickness of Walls.
  - 1. Minus 1/4 inch; plus 1/2 inch.

3.06 REINFORCING:

- A. When a foundation dowel does not line up with a vertical core, it shall not be sloped more than one

horizontal in six vertical. Dowels shall be grouted into a core in vertical alignment, even though it is in an adjacent cell to the vertical wall reinforcing.

- B. Reinforcing bars shall be straight except for bends around corners and where bends or hooks are detailed on the plans.
- C. Reinforcing steel shall be lapped 48 bar diameters minimum where spliced, and shall be separated by one bar diameter or wired together.
- D. Vertical bars shall be held in position at top and bottom and at intervals not exceeding 192 diameters of the reinforcing bar, nor 10 feet.
- E. Horizontal reinforcing bars shall be placed in continuous masonry course, consisting of bond-beam or trough block units, and shall be solidly grouted in place.
- F. Vertical reinforcing steel shall have a minimum clearance of not less than one bar diameter between bars, and shall be placed in the center of walls.
- G. Wire reinforcement shall be completely embedded in mortar or grout. Joints with wire reinforcement shall be at least twice the thickness of the wire.
- H. Wire reinforcement shall be lapped at least 6 inches at splices and shall contain at least one cross wire on each piece of reinforcement in the lapped distance.

**3.07 GROUTING GENERAL:**

- A. Reinforcing steel shall be secured in place and inspected by the Special Inspector before grouting starts.
- B. Mortar dropping should be kept out of the grout space.
- C. All grout shall be puddled or vibrated in place.
- D. Vertical cells to be filled shall have vertical alignment to maintain a continuous unobstructed cell area not less than 2" x 4".
- E. Cells containing reinforcing shall be solidly filled with grout and pours shall be stopped one and one-half inches below the top of a course to form a key at pour joints.
- F. Grouting of beams over openings shall be done in one continuous operation.
- G. The tops of unfilled cell columns under a horizontal masonry beam shall be covered with metal lath or special units shall be used to confine the grout to the beam section.
- H. All bolts and anchors, inserted in the wall shall be solid grouted in place.

**3.08 LOW LIFT GROUTING:**

- A. Provide minimum clear dimension of 2" and minimum clear area of 8 sq. in. in vertical cores to be grouted.
- B. Place vertical reinforcement prior to laying of CMU. Extend above elevation of maximum pour height as

required to allow for splicing. Support in position at vertical intervals not exceed 192 bar diameter nor 10 ft.

- C. Lay CMU to maximum pour height. Do not exceed 5' height, or if bond beam occurs below 5' height stop pour at course below bond beam.
- D. Pour grout using container with spout or by chute. Rod or vibrate grout during placing. Place grout continuously do not interrupt pouring of grout for more than one hour. Terminate grout pours 1-1/2" below top course of pour.
- E. Bond beams. Stop grout in vertical cells 1-1/2" below bond beam course. Place horizontal reinforcement in bond beams; lap at corners and intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.

**3.09 HIGH LIFT GROUTING:**

- A. Do not use high-lift grouting technique for grouting of CMU unless minimum cavity dimension and area is 3" and 10 sq. in. respectively.
- B. Provide cleanout holes in first course at all vertical cells which are to be filled with grout.
- C. 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.
- D. Construct masonry to full height of maximum grout pour specified, prior to placing grout.
- E. Limit grout lifts to a maximum height of 5' and grout pour to a maximum height of 16' for single wythe hollow concrete masonry walls, unless otherwise indicated.

**3.10 MASONRY TESTING:**

- A. Continuous special inspecting required by special Inspector.
- B. Prism Tests: Masonry compressive strengths shall be verified by prism tests. Prisms shall be built by the contractor and tested by an independent testing laboratory approved by the architect and paid for by the contractor. Prisms shall be built utilizing materials being placed in the building and shall be built by the masons constructing the bearing walls. Masons building the prisms shall be picked at random and at least two (2) masons shall be used to construct the prisms for any one test. Prisms shall be built on pallets as required for handling and storage.
- C. Prisms: The minimum size for prisms shall be 8 inches long by 8 inches wide by 16 inches high. Prisms shall not be moved for at least three days after construction. Two basic prisms required for testing will be Prism "A" in which the cavity is not filled with grout and Prism "B" which will have the cavity filled with grout. Prism "B" may have the grout placed in the cavity within a period of 24 to 48 hours after the construction of the prism.
- D. Testing Procedure: The prisms shall be stored at the site, in air, for not less than 72 hours. Thereafter, they shall be stored in air temperatures not less than 65 degrees F., and shall be tested after aging 28 days. All handling of the prisms shall be by the Testing Laboratory. The ends of each prism shall be capped with a suitable material such as calcine gypsum, to provide bearing surface plant within 0.003 inch and approximately perpendicular to the axis of the prism. The prism shall then be tested in

accordance with the relevant provisions of the Method of "Sampling and Testing Concrete Masonry Units" ASTM C140, and the specified code published by the National Concrete Masonry Association or ACI 530.1. A recommended testing outline may be found in TEK 22, published by NCMA.

- E. Test Requirements: Each test shall consist of three prisms. One test shall be required for each 5,000 square feet of masonry work. Where in any one story height both grouted and ungrouted walls occur, one set of "A" prisms and one set of "B" prisms shall be made.
1. Correction factors for pier sizes from the NCMA Code or the ACI Specification shall be applied to the failure stress and the minimum acceptable corrected ultimate strength shall be 1500 psi.
  2. Additional testing and all corrective measures shall be at the expense of the contractor should any prisms fail to meet the minimum strength, or prove to have been improperly prepared.

END OF SECTION



## SECTION 05 120 - STRUCTURAL STEEL

### PART 1 GENERAL

#### 1.01 QUALIFICATIONS:

- A. Fabricator: Not less than 5 years experience in fabrication of structural steel for projects of similar scope.
- B. Steel Erector: Not less than 5 years experience in the erection of structural steel structures of similar magnitude to the proposed structure.

#### 1.02 STANDARDS AND CODES:

- A. American Institute of Steel Construction:
  - 1. AISC "Specification for Structural Steel Buildings, Allowable Stress Design, June 1, 1989, with Commentary".
  - 2. AISC "Code of Standard Practice".
  - 3. "Specifications for Structural Joints Using ASTM A325 or A490 Bolts", approved by the Research Council on Structural Connections of the Engineering Foundation, November 13, 1985.
  - 4. AISC "Quality Criteria and Inspection Standards".
- B. American Welding Society 1998 Edition:
  - 1. AWS "Structural Welding Code".
  - 2. AWS "Welding Symbols".
  - 3. AWS "Gas Metal-Arc Welding with CO2 Shielding".
  - 4. AWS "Non-Destructive Testing Symbols".
- C. American Society of Testing Materials (ASTM):
  - 1. ASTM A6/A GM-97b, "General Requirements for Rolled Steel Bars, Plate, Shapes, and Sheet Piling."
  - 2. ASTM A27-95, "Steel Castings, Carbon, for General Application".
  - 3. ASTM A36M-97a, "Carbon Structural Steel".
  - 4. ASTM A53-96, "Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless".
  - 5. ASTM A108-95, "Steel Bars, Carbon, Cold Finished, Standard Quality".
  - 6. ASTM A242-93a, "High-Strength Low-Alloy Structural Steel".
  - 7. ASTM A307-94, "Carbon Bolts and Studs, 60,000 psi Tensile Strength".
  - 8. ASTM A325-96, "Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength".
  - 9. ASTM A370-96, "Mechanical Testing of Steel Products".
  - 10. ASTM A490-93, "Heat Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength".
  - 11. ASTM A500-93, "Cold-Form Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes".
  - 12. ASTM A501-93, "Hot Formed Welded and Seamless Carbon Steel Structural".
  - 13. ASTM A992, Grade 50.
  - 14. ASTM A588-94, "High-Strength Low-Alloy Structural Steel with 50ksi Minimum Yield Point to 4

- inches thick".
15. ASTM C827-82, "Test Methods for Early Volume Change of Cementitious Mixtures".

1.03 ERECTION TOLERANCES:

- A. Plumb, level and align individual pieces in accordance with the requirements of the "Code of Standard Practice" of the AISC.

1.04 SUBMITTALS:

- A. Shop Drawings: Submit in accord with the Contract Conditions:
1. Indicate all shop erection details, including cuts, copes, connections, holes, bolts, welds and preparation required such as bevels, testing and backup bars.
  2. Indicate all welds, both shop and field, by AWS "Welding Symbols", A2.0, latest edition.

1.05 PRODUCT HANDLING:

- A. Delivery of materials to be installed under other sections:
1. Coordinate delivery of embedded items with General Contractor.
  2. Provide setting drawings for installation of embedded items to General Contractor.
- B. Storage and Materials:
1. Store structural steel members at the project site above ground on platforms, skids or other supports.
  2. Store bolts and weld rod in original unbroken containers with labels intact.
  3. Protect all items from corrosion affecting structural strength and use.

1.06 SEQUENCING, SCHEDULING AND PROCEDURES:

- A. The Contractor shall review the structural capacities of areas to be used for lifting devices, material delivery and storage and shall not exceed design loads without taking appropriate steps to compensate for the anticipated loads exceeding design loads.
- B. Any modifications, temporary or permanent, to the building's structural frame required to support erection equipment (including trucks, cranes and other devices) and its load shall be made by the Contractor at his own expense and as subject to review and directives of the Architect.
- C. Any redesign by the Contractor for his own convenience, if acceptable to the Architect, is to be paid for by the Contractor.
- D. Place lifting equipment in location approved by the General Contractor.
- E. The Contractor shall furnish and place any temporary guys, braces or falsework required to stabilize the structural steel during erection and it shall not be removed until the structure is fully erected and bolted or welded.
- F. The Contractor shall cooperate fully with authorized personnel making inspections of both shop and

field operations. The Contractor will provide access to scaffolds and work platforms and any necessary manpower to assist in the inspection of welding and bolting.

1.07 TESTING AND INSPECTION:

- A. An independent testing laboratory shall check structural steel erection for compliance with AISC Specifications including Part 6 of "Structural Joints Using ASTM A325 or A490 Bolts". Contractor shall coordinate erection and testing to facilitate construction.
- B. Inspection will be required of a random selection of 10 percent of all high strength shop and field bolting. To be acceptable, 95 percent of all bolts tested shall meet design tension, and no bolt shall test to less than 85 percent of design tension. If the bolting fails to meet this requirement, bolts shall be reworked by the Contractor and additional tests of 50 percent of all bolts shall be made until the above requirements are met.
- C. Where field welding has been used for structural connections, testing laboratory will perform visual inspections of minimum of 50 percent of welds. Should any welds fail, then 100 percent of welds shall be inspected.
- D. Full penetration field welds shall be radiographically inspected.

PART 2 PRODUCTS

2.01 MATERIALS:

- A. Structural Steel: All columns, bracing members, composite and non composite steel floor beams, roof beams shall conform to ASTM A992, Grade 50. All miscellaneous shapes and plates shall conform to ASTM A36, U.N.O.
- B. High-Strength Bolts: ASTM A325.
- C. Unfinished Bolts: ASTM A307, unless noted otherwise on structural drawings.
- D. Structural Tubes: ASTM A500, Grade B.
- E. Pipes: ASTM A53 Type E, Grade B.
- F. Filler Metal: E70 electrodes or equivalent. Electrodes shall be as recommended by their manufacturers for the position and other conditions of actual use.
- G. Paint for shop coat and touch-up field coat shall be combination of gray iron oxide and alkyd resin.
- H. Steel permanently exposed to weather shall be galvanized in accordance with applicable ASTM specifications, unless noted otherwise.
- J. Steel to receive spray-on fireproofing, or in contact with concrete, to be unpainted.

- K. Steel exposed to view shall be finish painted as specified elsewhere in these Specifications.
- L. Non Shrink Grout: High flow, non-metallic, controlled expansion type grout, with 6000 psi minimum compressive strength.

2.02 FABRICATION:

- A. Fabricate structural steel in accordance with AISC, except as modified or noted in these specifications.
- B. Drill or punch holes at right angles to the surface of the metal. Do not make or enlarge holes by burning. Remove burrs resulting from drilling operations.
- C. Apply one (1) shop coat of paint to all surfaces to receive shop primer, after cleaning of all rust, scale, and foreign matter. Surfaces shall be dry and clean at time of paint application.

2.03 CONNECTIONS:

- A. All connections shall conform to those shown on structural drawings or as approved by Architect.

2.04 BOLTING:

- A. Use high strength bolts in bearing.
- B. Size bolts allowing full thread engagement.
- C. Enter bolts into holes without damaging the thread.
- D. Oversize and short-slotted holes are subject to approval by Architect. If approved for use, standard hardened washers are required to provide adequate bearing area. Place washers on the exposed face of the oversized or short-slotted hole.
- E. Long-slotted holes are subject to approval by Architect.

2.05 WELDING:

- A. Prior to commencing welding, joint elements are to be bolted or tacked in intimate contact and adjusted to dimensions shown on drawings with allowance for any weld shrinkage.
- B. Shop splices not shown on drawings are subject to approval by Architect.
- C. Welding shall be performed by welders currently qualified under AWS standard qualification procedures to perform the type of work required.

PART 3 EXECUTION

3.01 ERECTION:

- A. Check alignment and elevations and locations of all anchor bolts. Report to Architect all gross errors

and proposed correcting methods prior to proceeding with corrections and base plate setting.

- B. Field correction of fabrication by flame cutting will only be permitted by written prior approval of the Architect.
- C. Provide all temporary erection bracing. Be responsible for design and installation of all erection bracing and for its safe removal.
- D. Assemble structural steel frames accurately to the lines and elevations indicated within the specific tolerances.
- E. Align and adjust accurately members forming parts of the complete frame before fastening.
- F. Splices shall be permitted only where indicated on drawings.
- G. Remove all temporary erection material (lifting hitches, column erection lugs, temporary gussets for bracing or guy cables, and related items).

**3.02 CONNECTIONS:**

- A. Connections shall comply with requirements specified in Part 2, Products.
- B. Remove run-off tabs and grind surfaces smooth where the tabs interfere with fireproofing and architectural treatment.
- C. Do not use powder actuated fasteners for connections onto structural steel unless written permission is granted by the Architect.

**3.03 PAINTING:**

- A. Immediately after erection and after review of weldments by Testing Agency, spot paint field connections and abraded places with the same paint used for shop coat. Touch up galvanized material with cold galvanizing compound.
- B. Surfaces shall be clean and dry before painting. Apply no paint in freezing weather.
- C. All touch-up painting to be by steel erector. See other parts of specifications for finish painting.

End of Section 05120



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## SECTION 05 210 - OPEN WEB JOISTS AND JOIST GIRDERS

### PART 1 GENERAL

#### 1.01 SCOPE

- A. Furnish all necessary, labor, material, and equipment to fabricate and erect open web joists.

#### 1.02 STANDARDS

- A. Comply with specifications, standards and recommendations of the following:

- American Institute of Steel Construction (AISC).
  - American Society for Testing and Materials (ASTM).
  - Steel Joist Institute (SJI), including "Standard Specifications and Load Tables.

#### 1.03 SHOP DRAWINGS

- A. In accordance with Division 1, submit shop drawings showing plan layout, complete details and schedules for fabrication and erection, including special connections, jointing, and accessories. Furnish templates for anchor bolt installation by others.

### PART 2 MATERIALS

#### 2.01 PRODUCTS

- A. Steel: ASTM A36, or other per AISC-SJI specifications.
- B. Fasteners: High-strength bolts and nuts, ASTM A325 or A490; unfinished bolts and nuts, ASTM A307, Grade A.

### PART 3 EXECUTION

#### 3.01 FABRICATION

- A. All joists shall be manufactured by one of the following:
  - 1. A member company of the Steel Joist Institute or American Institute of Steel Construction whose designs have been approved by the Steel Joist Institute.
  - 2. A company not a member of the Steel Joists Institute who shall, prior to the fabrication, submit to and receive approval of the following items from the Architect:
    - a. Complete design calculations for the joists to be supplied.
    - b. Complete fabrication details.
    - c. A certificate bearing the seal of a registered professional engineer stating that the joist design, materials and workmanship comply with these specifications.
- B. Identify each joist with its mark.

3.02 SHOP PAINT

- A. Comply with AISC-SJI specifications for materials and application, except asphalt paint not permitted.

3.03 BRIDGING

- A. Comply with AISC-SJI specifications for type of joists and installation requirements. Provide bridging anchors for ends of bridging lines terminating at walls or beams.

3.04 END ANCHORAGE

- A. Comply with AISC-SJI specifications unless otherwise indicated.

3.05 ERECTION

- A. Comply with AISC-SJI specifications for bridging, end supports, and handling and erection unless otherwise indicated.

END OF SECTION

## SECTION 05 300 - STEEL DECKING

### PART 1 GENERAL

- 1.01 Related work specified in other Sections includes Structural Steel and Open Web Joists.
- 1.02 Work described in this Section includes Steel Roof Deck and Composite Steel Floor Deck.
- 1.03 INDUSTRY STANDARDS:

Reference: Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). These referenced publications may be subject to special conditions and/or limitations where specified herein.

The American Society for Testing & Materials (ASTM)  
The Steel Deck Institute (SDI)  
American Iron & Steel Institute (AISI)  
American Welding Society (AWS)

- 1.04 SUBMITTALS: In accordance with requirements in Division 1, submit the following:
- A. Shop Drawings: Submit shop drawings in accordance with the Contract Conditions. Shop drawings shall indicate layout of decking, clearance and connections to other work, gages, deck section properties and types of metal.
- B. Structural Data: Submit structural properties of decking for approval.

### PART 2 PRODUCTS

- 2.1 MATERIALS:
- A. Painted (unless deck to be spray fireproofed or with concrete topping then use galvanized deck) Steel Roof Deck: Sheet steel for painted roof deck and accessories shall conform to ASTM A653-94 Structural Quality grade 33 or higher. Galvanized deck to conform to ASTM 924-94 with a minimum coating class of G90 as defined in ASTM A 653-94. Deck shall be of type and have section properties as specified in the structural drawings.
- B. Galvanized Conform Form Deck: Deck and accessories shall be composed of sheet steel conforming to ASTM A653-94 Structural Quality, having a minimum yield strength of 33,000 psi, galvanized conforming to ASTM A924-94 with a minimum coating class of G60 as defined in ASTM A653-94. Deck shall be of type and have section properties as specified in the structural drawings.

### PART 3 EXECUTION

- 3.01 Before erection, sheets shall be protected from weather. Do not store in contact with ground.
- 3.02 Place decking and weld as indicated on the drawings. Welding electrodes to be as recommended by manufacturer. Provide sidelap connectors as indicated on the drawings.
- 3.03 Provide temporary shoring of decking when called for on the drawings.

3.04 Call Architect for inspection of deck installation before placing concrete or insulation.

END OF SECTION

## SECTION 05 400 - COLD-FORMED METAL FRAMING

### PART 1 GENERAL

#### 1.01.1 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. This section describes structural components of non-loadbearing exterior walls and load-bearing interior walls only. See Section 07250 for no-structural cold-formed framing.

#### 1.02 DESCRIPTION OF WORK:

- A. Extent of cold-formed framing is shown on drawings.
- B. Types of cold-formed metal framing units include the following.

#### 1.03 QUALITY ASSURANCE:

- A. Component Design: Compute structural properties of studs and joists in accordance with AISI "Specification for Design of Cold-Formed Steel Structural Members, 1996 edition."
- B. Allowable Tolerance: Vertical or horizontal plan +1/8" in 10'-0".

#### 1.04 SUBMITTALS:

- A. Product Data: Submit manufacturer's product information and installation instructions for each item of cold-formed framing and accessories. Submit manufacturer approved span deflection tables and design calculations prepared by a Professional Engineer licensed in the state in which the project is constructed to indicate that all cold-formed metal framing members satisfy the requirements of the drawings.
- B. Shop Drawings: Submit shop drawings for special components and installations not fully dimensioned or detailed in manufacturer's product data.
  - 1. Include drawings for framing members showing size and gauge designations, number, type, location and spacing. Indicate supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installation.

#### 1.05 DELIVERY AND STORAGE:

- A. Protect metal framing units from rusting and damage. Deliver to project site in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Store off ground in a dry ventilated space or protect with suitable waterproof coverings.

### PART 2 PRODUCTS

#### 2.01 METAL FRAMING:

- A. System Components: With each type of metal framing required, provide manufacturer's standard steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories as recommended by manufacturer for applications indicated, as needed to provide a complete metal framing system, and as noted on the Drawings.
- B. Materials and Finishes:
  - 1. For 54 mil (16 gauge) and heavier galvanized

- units, fabricate metal framing components of structural quality steel sheet with a minimum yield point of 50,000 psi, meeting requirements of ASTM A-446 Grade "50".
2. For 43 mil (18 gauge) and lighter galvanized units, fabricate metal framing components of commercial quality steel sheet with a minimum yield point of 33,000 psi; ASTM-446. Components shall be a minimum of 33 mil (20 gauge).
  3. Provide galvanized finish to metal framing components complying with ASTM A-525 for minimum G 60 coating.
    - a. Manufacturer: Subject to compliance with requirements, provide "C"-shaped, load bearing steel studs and steel joists of one of the following:
      - Alabama Metal Industries Corp.
      - Allied Studco
      - California Expanded Metal Products Co.
      - Clark Steel Framing, Inc.
      - Consolidated Systems, Inc.
      - Dale/Incor, Inc.
      - Dietrich Industries, Inc.
      - The Formetal Company
      - Knorr Steel Framing Systems
      - Marino/Ware, Division of Ware Industries
      - Southeastern Stud & Components, Inc.
      - Unimast Incorporated
      - Westren Metal Lath

## 2.02 FABRICATION

- A. General: Framing components may be prefabricated into panels prior to erection. Fabricate panels plumb, square, true to line and braced against racking with joints welded. Perform lifting of prefabricated panels in a manner to prevent damage or distortion.
- B. Fastenings: Attach similar components by welding. Attach dissimilar components by welding, bolting, or screw fasteners, as standard with manufacturer.
- C. Wire tying of framing components is not permitted.

## PART 3 EXECUTION

### 3.01 INSTALLATION:

- A. Manufacturer's Instructions: Install metal framing systems in accordance with manufacturer's printed or written instructions and recommendations, unless otherwise indicated.
- B. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as recommended by stud manufacturer for type of construction involved, except do not exceed 24" o.c. spacing for nail or powder-driven fasteners, or 16" o.c. for other types of attachment, or as otherwise shown on the Drawings. Provide fasteners at corners splices and ends of tracks.
- C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- D. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.
- E. Install supplementary framing, blocking and bracing in metal framing system wherever walls, partitions and joists are indicated to support fixtures, equipment, services, casework, heavy trim

and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.

- F. Installation of Wall Stud System: Secure studs to bottom runner tracks by screw fastening at both inside and outside flanges. Top track to allow for live and wind load vertical deflection of structure.
- G. Frame wall openings larger than 2'-0" square with double stud at each jamb of frame except where more than 2 are either shown or indicated in manufacturer's instructions, or on the Drawings. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb same as full-height studs of the wall. Secure stud system wall opening frame in manner indicated on fabrication drawings.
- H. Frame both sides of expansion and control joints, with a separate studs; do not bridge the joint with components of stud system. See gypsum wall specifications for spacing of control joints.
- I. Where curtain wall framing not braced each flange by screws to sheathing and wallboard, install horizontal bridging in studs system, spaced (vertical distance) at not more than 4'-6" o.c. Mechanically fasten to stud flange or web at each intersection.
- J. Field Painting: Touch-up shop-applied protective coatings damaged during handling and installation. Use compatible primer for prime coated surface; use galvanizing repair paint for galvanized surfaces.

END OF SECTION



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## SECTION 05 500 - METAL FABRICATIONS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Shop fabricated steel items.

#### 1.02 RELATED SECTIONS

- A. Section 03300 - Cast-In-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 04810 - Unit Masonry Assemblies: Placement of metal fabrications in masonry.

#### 1.03 REFERENCES

- A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 1996.
- B. ASTM A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 1996.
- C. ASTM A 123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 1989a.
- D. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 1995.
- E. ASTM A 283/A 283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 1993a.
- F. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength; 1994.
- G. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 1996.
- H. ASTM A 325M - Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric); 1993.
- I. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 1993.
- J. ASTM A 501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 1993.
- K. ASTM D 3841 - Standard Specification for Glass Fiber Reinforced Plastic Panels; 1997.
- L. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 1993.
- M. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 1996.
- N. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).
- O. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).

- P. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1995 (Part of Steel Structures Painting Manual, Vol. Two).

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
  - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

#### 1.05 QUALITY ASSURANCE

- A. Design all structural components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

### **PART 2 PRODUCTS**

#### 2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500, Grade B.
- C. Plates: ASTM A 283.
- D. Bolts, Nuts, and Washers: ASTM A 325 galvanized to ASTM A 153/A 153M for galvanized components.
- E. Welding Materials: AWS D1.1; type required for materials being welded.
- F. Shop and Touch-Up Primer: SSPC-Paint 15, Type I - Red Oxide.
- G. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

#### 2.02 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

**2.03 FINISHES - STEEL**

- A. Prime paint all steel items.
  - 1. Exceptions: Galvanize items to be embedded in concrete or masonry and items specified for painted finish.
  - 2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.
- E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A 123. Provide minimum 1.25 oz/sq ft galvanized coating.
- F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A 123. Provide minimum 1.25 oz/sq ft galvanized coating.

**2.04 FABRICATION TOLERANCES**

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.

**3.02 PREPARATION**

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

**3.03 INSTALLATION**

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Perform field welding in accordance with AWS D1.1.
- D. Obtain approval prior to site cutting or making adjustments not scheduled.
- E. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be

in contact with concrete.

**3.04 ERECTION TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION**

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## SECTION 05 586 - METAL COLUMN COVERS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. All labor and materials for the complete installation of prefabricated column covers.

#### 1.02 RELATED SECTIONS

- A. Section 01300 – Administrative Requirements

#### 1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard product information for specified covers.
- C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
- D. Samples: Submit three finish samples, 8"x8" in size, illustrating color and textures.
- E. Manufacturer's Instructions: Indicate requirements for installation and cleaning.
- F. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

#### 1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than ten (10) years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years experience.

#### 1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver column covers to project site in manufacturer's standard protective coverings.
- B. Provide one (1) year manufacturer warranty for manufacture and installation of column covers.

### PART 2 PRODUCTS

#### 2.01 BASE BID MANUFACTURER

- A. Pittcon Industries Model Series 9000.
- B. Other Acceptable Manufacturers:
  - 1. MM Systems, Pendergrass GA.
  - 2. Industrial Louvers, Inc., Delano, MN.
  - 3. Fry Reglet, Alpharetta, GA

#### 2.02 MATERIALS

- A. Column covers shall be roll-formed to specific dimensions and tolerances, and accurately formed to radii

indicated on the drawings.

- B. Column covers shall be fabricated in two (2) vertically divided sections attached with a demountable interlock joint.
- C. Column covers shall be fabricated in single length heights of 16'-0" where required, with the addition of stacking joints to allow for heights above 16'-0".

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that column covers are free of damage or defects prior to installation.
- B. Verify that field conditions are acceptable and are ready to receive work.

#### **3.02 INSTALLATION**

- A. Install column covers in accordance with manufacturer's instructions.
- B. Install column covers plumb and level.

#### **3.03 CLEANING**

- A. Remove protective material provided by column cover manufacturer.
- B. Clean all visible surfaces after installation.
- C. Protect installed column covers from subsequent construction operations.

**END OF SECTION**

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## SECTION 06 100 - ROUGH CARPENTRY

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Roof sheathing
- B. Preservative treatment of wood.
- C. Fire retardant treatment of wood.
- D. Telephone and electrical panel boards.
- E. Wood nailers, curbs, and cant strips for roofing and items installed on roof.
- F. Concealed wood blocking for support of accessories and related construction.
- G. Miscellaneous wood nailers and furring strips.

#### 1.02 RELATED SECTIONS

- A. Section 07212 - Board and Batt Insulation: Extruded polystyrene board insulation.

#### 1.03 REFERENCES

- A. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; American Wood-Preservers' Association; 1997.
- B. AWPA C20 - Structural Lumber -- Fire Retardant Treatment by Pressure Processes; American Wood-Preservers' Association; 1996.
- C. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 1994.
- D. SPIB (GR) - Standard Grading Rules for Southern Pine Lumber; Southern Pine Inspection Bureau, Inc.; 1994.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and application instructions.

#### 1.05 QUALITY ASSURANCE

- A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

### PART 2 PRODUCTS

#### 2.01 DIMENSION LUMBER

- A. Grading Agency: Southern Pine Inspection Bureau, Inc. (SPIB).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Stud Framing (2 x 2 through 2 x 6 ):
  - 1. Species: Any allowed under referenced grading rules.
  - 2. Grade: No. 2.
- E. Joist, Rafter, and Small Beam Framing (2 x 6 through 4 x 16 ):
  - 1. Species: Any allowed under grading rules.
  - 2. Grade: No. 1 & Btr..
- F. Miscellaneous Blocking, Furring, and Nailers:
  - 1. Lumber: S4S, No. 2 or Standard Grade.
  - 2. Boards: Standard or No. 3.

#### 2.02 CONSTRUCTION PANELS

- A. APA Rated Roof Sheathing: Exposure 1, and as follows:
  - 1. Thickness: As indicated on the drawings
  - 2. Structural I.
  - 3. Span Rating: 24/0.
- B. Miscellaneous Panels:
  - 1. Electrical Component Mounting: APA rated sheathing, fire retardant treated.

#### 2.03 ACCESSORIES

- A. Fasteners and Anchors:
  - 1. Fasteners: Hot-dipped galvanized steel for high humidity and treated wood locations.
  - 2. Fasteners at Metal Deck: 2-1/2 inch zinc coated steel screws.
  - 3. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
  - 4. Anchors: Toggle bolt type for anchorage to hollow masonry.

#### 2.04 FACTORY WOOD TREATMENT

- A. Fire Retardant Treatment: AWPA Treatment C20, Exterior Type, chemical treatment pressure impregnated; capable of providing a maximum flame spread/smoke development rating of 20 / 25.
- B. Pressure Treatment of Lumber Above Grade: AWPA Treatment C2 using waterborne preservative to 0.25 lb/cu ft retention.
  - 1. Kiln dry after treatment to maximum moisture content of 19 percent.
  - 2. Treat wood in contact with masonry or concrete.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION OF ACCESSORIES AND MISCELLANEOUS WOOD**

- A. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.
- B. Coordinate curb installation with installation of decking and support of deck openings.

#### **3.02 INSTALLATION OF CONSTRUCTION PANELS**

- A. Roof Sheathing: Secure panels perpendicular to direction of structural framing members, with ends staggered and sheet ends over firm bearing.
  - 1. Starting at low edge of roof, place panels leaving space for future expansion at edge.
  - 2. Place subsequent panels in like manner, lightly abutting the adjacent panel and attaching sheathing clips between panels.
  - 3. Stagger panel joints in adjacent courses to avoid through joints and assist in diaphragm action.
  - 4. Use sheathing clips between roof framing members.
  - 5. Provide solid edge blocking between sheets where necessary.
  - 6. Secure panels to metal deck with screws installed from the building interior side of the work.
    - a. Fasteners shall be installed at all panel corners and at a maximum 24 inches on center horizontally and vertically, located in the recessed flute of the metal deck. In panels where a splice occurs, additional fasteners shall be installed on both sides of splice at a maximum of 6 inches from splice and 24 inches on center. Fasteners shall be held back 1-1/2 inches from edge of panel.

#### **3.03 SITE APPLIED WOOD TREATMENT**

- A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.
- B. Allow preservative to dry prior to erecting members.

**END OF SECTION**



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## SECTION 06 400 - ARCHITECTURAL WOODWORK

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES:

- A. Interior architectural woodwork..
  - 1. Wood Paneling
  - 2. Wire Cloth-clad Panels
  - 3. Plastic laminate clad cabinets.
  - 4. Plastic laminate clad countertops.
  - 5. Cabinet hardware.
  - 6. Interior Display Wall Panels
  - 7. Standing and running trim.
  - 8. Solid surface countertops.
  - 9. Shelving and Coat Rods.

#### 1.02 RELATED SECTIONS

- A. Section 01 030: Alternates
- A. Section 01 305: Submittals.
- B. Section 01 600: Product Requirements.

#### 1.03 REFERENCES

- A. ANSI A208.2-1994 - Medium Density Fiberboard (MDF); 1994.
- B. Architectural Woodwork Quality Standards; Sections 300, 400B and 600; Architectural Woodwork Institute (AWI); 1994.
- C. BHMA A156.9-1994 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association.
- D. BHMA A156.18-1987 - American National Standard for Materials and Finishes; Builders Hardware Manufacturers Association; 1987.
- E. NEMA LD 3-1991 - High Pressure Decorative Laminates (HPDL); National Electrical Manufacturers Association; 1991.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate plans and elevations; details at a large scale (minimum 3"=1'-0"); show location of each item, identify components used, and indicate method of attachment.
- C. Product and Material Information:
  - 1. Wood Paneling:
    - a. Samples: Provide veneer samples of each wood species showing full range of wood characteristics in proposed finishes.
  - 2. High Pressure Decorative Laminates.
    - a. Product data.
    - b. Samples for selection: Manufacturer's full color and pattern range.
    - c. Maintenance data.
  - 3. Low pressure decorative laminates.

- a. Product data.
- b. Samples for selection: Manufacturer's full color and pattern range.
- c. Maintenance data.
- 4. Cabinet Hardware:
  - a. Product data.
  - b. Samples for selection: Manufacturer's full color and pattern range.
  - c. Maintenance data.
- 5. Interior Display Wall Panels:
  - a. Product data.
  - b. Samples for selection: Manufacturer's full color and pattern range.
  - c. Maintenance data.
- 6. Solid Surfacing Material:
  - a. Product data.
  - b. Samples for selection: Manufacturer's full color and pattern range.
  - c. Maintenance data.
- 7. Standing and Running Trim:
  - a. Samples: Provide samples of each wood species showing full range of wood characteristics in proposed finishes.
- 8. Wire Cloth:
  - 1. Product data.
  - 2. Samples for selection: Manufacturer's full design and finish range.
  - 3. Maintenance data.

#### 1.05 QUALITY ASSURANCE

- A. Quality of Materials and Workmanship: Provide woodwork that complies with the requirements of "Architectural Woodwork Quality Standards," published by Architectural Woodwork Institute (AWI) (hereinafter referred to as "woodworking standard").
- B. Where contract documents indicate requirements which are less restrictive than the woodworking standard, comply with the minimum requirements of the woodworking standard.
- C. Fabricator Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- D. Installer Qualifications: Fabricator shall install his own work.

#### 1.06 DELIVERY, STORAGE, AND PROTECTION

- A. Store materials for interior woodwork indoors in conditioned spaces maintained within design temperature and humidity range as determined by the fabricator.

#### 1.07 PROJECT CONDITIONS

- A. Coordinate installation of woodwork with other work to avoid damage.

#### 1.08 ENVIRONMENTAL REQUIREMENTS

- A. Maintain final design temperature and humidity in areas where woodwork is installed.
  - 1. Installed woodwork shall be within a 1.0 percent tolerance of optimum moisture content, as determined by the fabricator, from date of installation through remainder of construction period.

### **PART 2 PRODUCTS**

#### 2.01 BASIC MATERIALS AND FABRICATON METHODS

- A. General: Except as otherwise indicated, comply with the following requirements for architectural woodwork not specifically indicated as prefabricated or prefinished standard products.

- B. Wood Moisture Content: Provide kiln-dried lumber with an average moisture content range of 6% to 11%. Maintain temperature and relative humidity during fabrication, storage and finishing operations so that moisture content values for the woodwork at time of installation do not exceed 5% to 10%.
- C. Plastic Laminate: Comply with NEMA LD-3 for type, thickness, color, pattern, and finish indicated for each application, or if not indicated, as selected by the Architect from the manufacturer's standard products.
  - 1. Acceptable Manufacturers:
    - a. WilsonArt, Inc.
    - b. Formica.
    - c. Nevamar.
- D. Quality Standards: For each of the following types of architectural woodwork, comply with indicated standards as applicable:
  - 1. Casework and Countertops: AWI Section 400B.
  - 2. Shelving: AWI Section 600.
  - 3. Miscellaneous Work: AWI Section 700.
- E. Design and Construction Features: Comply with details shown for profile and construction of architectural woodwork; and, where not otherwise shown, comply with applicable AWI Quality Standards, with alternate details as Fabricator's option and as approved by the architect.
- F. Fit woodwork to actual construction. If it is not possible, or practical, to take field measurements before fabricating, provide adequate installation tolerances and scribe and trim to fit.
- G. Pre-Cut Openings: Fabricate architectural woodwork with pre-cut openings, where possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams for proper size and shape. Smooth edges of cutouts, and where located in countertops and similar exposures seal edges of cutouts with a water resistant coating.

## 2.02 ARCHITECTURAL WOODWORK

- A. Wood Paneling: AWI Section 200, Grade I for transparent finish.
  - 1. Provide hardwood veneered panels where indicated on the drawings. Provide nosing as shown at all exposed panel edges.
    - a. Veneer: Plain sliced natural birch, balance matched.
      - 1) Stains: To be selected from manufacturer's standard colors, minimum 2 stains.
- B. Plastic Laminate Finished Cabinets: AWI Section 400, Custom Grade
  - 1. Grade: Premium
  - 2. Construction: Reveal Overlay.
  - 3. Exposed surfaces: Provide high pressure laminate in grades indicated for the following types of surfaces:
    - a. Horizontal Surfaces: GP-50 (0.050" nominal thickness).
      - 1) See Finish Plans for laminate color for all horizontal surfaces.
    - b. Vertical Surfaces: GP-50 (0.050" nominal thickness)
    - c. Edges of exposed surfaces, including edges of doors and drawers when open: GP-50 (0.050" nominal thickness) to match adjacent surfaces..
  - 4. Semi-Exposed Surfaces: GP-20 (0.020" nominal thickness).
- C. Display Wall Paneling (at Ticketing/Gifts/Concessions 115):
  - 1. Provide metal lined slotted panels for supporting display systems.
  - 2. Exposed faces to be manufacturer's standard high pressure plastic laminate in color to be selected.
  - 3. Provide shelving and supports as indicated on the drawings.
- D. Wire Cloth Clad Panels:
  - 1. Provide wire cloth wrapped panels as indicated on the drawings and as follows:
    - a. Panel Substrate: Provide painted plywood or medium density fiberboard panel for attachment of wire cloth.

- b. Wire Cloth: Stainless steel, mesh grade 60, folded as indicated on the drawings.
  - c. Attachment nails: Stainless steel tacks.
- 2. Wire Cloth Fabricator: Provide manipulated wire cloth from the following artistic fabricator:  
Chester Old  
410 Lakeshore Drive  
Atlanta, Georgia 30307  
(404) 378-9413  
chesterold@aol.com
- E. Shelving and Coat Rod:
  - 1. Exposed shelving surfaces: Provide high pressure laminate in grades indicated for the following types of surfaces:
    - a. Horizontal Surfaces: GP-50 (0.050" nominal thickness).
      - 1) See Finish Plans for laminate color for all horizontal surfaces.
    - b. Vertical Surfaces: GP-50 (0.050" nominal thickness)
  - 2. Coat Rod: Knappe & Vogt, Model 750 1 Heavy Duty chrome-look steel tubing, 1-1/16" diameter, cut to length.
- F. Solid Surfacing Countertops:
  - 1. General: Except as otherwise indicated, provide separate solid surface countertops (installed on other casework or other support system as indicated) to comply with requirements for casework for solid surfacing materials.
  - 2. Grade: Custom.
  - 3. Edges: Ease outside corners where vertical and horizontal surfaces meet.

### 2.03 CABINET HARDWARE AND ACCESSORY MATERIALS

- A. General: Provide cabinet hardware and accessory materials associated with architectural woodwork, except for units which are specified as "door hardware" in other sections of the specifications.
- B. Cabinet Hardware Quality Level: Type 2 (institutional), unless otherwise indicated.
- C. Exposed Hardware Finish: Except where not available or indicated otherwise, provide exposed hardware with BHMA Code 626 bright chrome finish (US26).
- D. Cabinet Door Hardware: Provide catches, concealed hinges and locks of types indicated, to accommodate each door size and style.
  - 1. Door Pulls: As indicated on the drawings.
  - 2. Concealed Hinges: Grass 3000 Series
  - 3. Magnetic Catches: Concealed round "bullet" type mounted in frame.
- E. Drawer Hardware: Provide slides and locks to accommodate each drawer size and style.
  - 1. Drawer Pulls: As indicated on the drawings.
  - 2. Drawer Slides: Equip each drawer with side-mounted, full extension, ballbearing, nylon roller drawer slides with load capacity of 75 pounds per pair.
- F. Shelf Supports: Where shelving is indicated to be "adjustable", provide pre-drilled panels with hardware of type needed to support shelves with uniform 40 pound per square foot loading.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Condition woodwork to average prevailing temperature and humidity conditions in installation areas prior to installing. Do not proceed with woodwork installation until the required ambient conditions can be properly maintained.
- B. Deliver concrete inserts and similar anchoring devices to be built into substrates in advance of time substrates are to be built.

- C. Prior to installation of architectural woodwork, examine shop fabricated work for completion, and complete work as required, including back-priming and removal of packing.

### 3.02 TRANSPARENT FINISH FOR ARCHITECTURAL WOODWORK

- A. Fill all fastener holes with tinted filler to match adjacent wood surfaces.
- B. Apply sanding sealer to transparent finished wood prior to finish sandings.
- C. Sand wood to receive transparent finishes as required by AWI standards.
- D. Apply clear polyurethane coating to wood materials as recommended by the polyurethane manufacturer. Seal all exposed wood surfaces.

### 3.03 FABRICATION

- A. Fabricate each architectural woodwork item in accordance with the corresponding AWI Standards for the item type and as specified.
- B. Wire Cloth-Clad Panels:
  - 1. Fabricate panel substrate in accordance with AWI Section 400, Custom Grade.
  - 2. Paint panel surfaces in color as selected by the Architect and in accordance with 09 900 Painting.
  - 3. Wire Cloth Application:
    - a. Panel Covering: Using protective handwear, cut wire cloth to size and shape of template. Locate wire cloth on painted wood substrate and attach using stainless steel tacks so that wire cloth is tight against wood panel. Minimize the number of visible fasteners used to achieve attachment of the wire cloth.
  - 4. Wire Cloth Fabricator: Chester Old (404) 378-9413.

### 3.03 INSTALLATION

- A. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level (including countertops); and with 1/16" maximum offset in flush adjoining surfaces, and 1/8" maximum offsets in revealed adjoining surfaces.
- B. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- C. Anchor woodwork to anchors or blocking built into or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork, and matching final finish where transparent finish is indicated.
- D. Cabinetry: Install without distortion so that doors and drawers will fit openings properly and be accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.
- E. Countertops: Anchor securely to base units where indicated. If no base units are provided, anchor securely to support system in adjacent partition.
- F. Wire Cloth-Clad Panels: Using protective handwear, attach "z-clips" or other blind fastening system to panels and the wall where panels are to be hung. Install panels plumb and level and anchor securely to substrate.

3.04 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION

- A. Repair damaged and defective woodwork wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean hardware, lubricate and make final adjustments for proper operation.
- C. Clean woodwork and wire cloth panels on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.
- D. Complete the finishing work specified as work of this section, to whatever extent not completed at the shop or prior to installation of woodwork.
- E. Protection: Installer of architectural woodwork shall advise Contractor of procedures required to protect architectural woodwork during remainder of construction period to ensure that work will be without damage or deterioration at time of acceptance.

**END OF SECTION**

## SECTION 07 115 - BITUMINOUS DAMPPROOFING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Bituminous dampproofing.

#### 1.02 RELATED SECTIONS

- A. Section 04 210 - Brick Masonry.
- B. Section 04 220 - Concrete Unit Masonry.

#### 1.03 REFERENCES

- A. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 1994 (reapproved 2000).
- B. ASTM D 4479 - Standard Specification for Asphaltic Roof Coating - Asbestos Free, Type 1; 2000.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide properties of primer, bitumen, and mastics.
- C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention. Include application rates for each type installation specified.

#### 1.05 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until dampproofing has cured.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Products specified as standard of quality are indicated in paragraph 2.02 Cold Asphaltic Products.
  - 2. Products of manufacturers listed below meeting indicated standards and specified manufacturer's product data characteristics, except as modified below, and certified as asbestos free, are acceptable for use, subject to approval of product list.
    - a. ChemRex, Inc.
    - b. Karnak Chemical Corp.
    - c. Lambert Corp.
    - d. W. R. Meadows, Inc.

#### 2.02 COLD ASPHALTIC MATERIALS

- A. Cavity Wall Dampproofing
  - 1. Acceptable Products:
    - a. Karnak Chemical Corp.; 83AF.
    - b. Lambert Corp.; Waterban 50SM.
    - c. W. R. Meadows, Inc.; Sealmastic Semi-Mastic.
  - 2. Characteristics: Cold-applied, bituminous mastic; brush or spray applied in accordance with ASTM D4479-00.
  - 3. Primer: Type recommended by dampproofing manufacturer for application to concrete unit masonry or concrete substrate.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify existing conditions before starting work.

- B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.
- C. Verify items which penetrate surfaces to receive dampproofing are securely installed.

**3.02 PREPARATION**

- A. Protect adjacent surfaces not designated to receive dampproofing.
- B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions. Remove all dirt, grease, mortar droppings and foreign matter from substrate.
- C. Do not apply dampproofing to surfaces unacceptable to manufacturer.
- D. Apply mastic to seal penetrations, small cracks, or minor honeycomb in substrate.

**3.03 APPLICATION**

- A. Prime surfaces in accordance with manufacturer's instructions.
- B. Apply dampproofing at temperatures above 40 degrees F. to dry, cured surfaces.
- C. Cavity Walls:
  - 1. Brush or trowel apply dampproofing at 6-10 mils DFT to pin hole-free in accordance with manufacturer's product data; applied pin hole free.
  - 2. Apply dampproofing to exterior face of interior masonry wythe in exterior double wythe walls.
- D. Seal items projecting through dampproofing surface with mastic. Seal watertight.

**3.04 CLEAN-UP**

- A. Remove debris resulting from work at completion of dampproofing operations, including spilled materials.

**END OF SECTION**

## SECTION 07 160 - FLUID APPLIED WATERPROOFING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. All labor and materials for installing waterproofing, drainage board and protection course and associated accessories.

#### 1.02 RELATED SECTIONS

- A. Section 03300 – Cast-in-Place Concrete

#### 1.03 REFERENCE STANDARDS

- A. ASTM D-36-95 (2000): Standard Test Method for Softening Point of Bitumen (Ring and Ball Apparatus).
- B. ASTM D-5329-04: Standard Test Methods for Sealants and Fillers, Hot Applied for Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements.
- C. ASTM D-3407-78: Standard Test Method for Joint Sealants, Hot Poured, for Concrete and Asphaltic Pavement.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Certification that all materials are from a single-source manufacturer.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's unopened factory sealed wrapping.
- B. Store materials in a clean, dry area protected from water and direct sunlight.
- C. Store adhesives between 60° F. and 80° F. If exposed to lower temperatures, restore to 60° F minimum temperature before using.

#### 1.06 PROJECT CONDITIONS

- A. Install membrane waterproofing only during clear, dry weather. All application surfaces shall be free of water, dew, frost snow and ice.
- B. Install membrane waterproofing only when ambient air temperatures are above 0° F.
- C. Prepare and apply membrane in well ventilated areas.
- D. Keep membrane free of foreign matter and chemicals prior to installation of protection board.
- E. Concrete wall surface condition: Apply membrane when manufacturer's recommended conditions have been met.

#### 1.07 WARRANTY

- A. Provide single source warranty from manufacturer.
  - 1. Material Warranties (excludes labor): 10 years
  - 2. Watertightness (labor and materials): 5 years

## PART 2 PRODUCTS

### 2.01 BASIS OF DESIGN

- A. Monolithic Membrane 6125-EV
  - 1. Manufacturer: American Hydrotech, Inc.; [www.hydrotechusa.com](http://www.hydrotechusa.com)
- B. Acceptable Manufacturers:
  - 1. Carlisle Coatings and Waterproofing, Inc.; [www.carlisle-ccw.com](http://www.carlisle-ccw.com).
  - 2. TAMKO Waterproofing Products; [www.tamko.com](http://www.tamko.com).

### 2.02 MATERIALS

- A. Membrane: Membrane shall be hot, fluid applied, rubberized asphalt membrane meeting the following CGSB-37.50-M89 standard and other pertinent physical properties:
  - 1. Water Absorption: .11 gram weight gain.
  - 2. Water Resistance: No delamination, blistering, emulsification or deterioration.
  - 3. Elongation: 1000% minimum.
  - 4. Resiliency: 40% minimum.
- B. Surface Conditioner: Provide manufacturer's standard surface conditioner for the substrate where membrane is placed.
- C. Flashing/Reinforcing: Provide 60 mil thick, uncured neoprene flashing/reinforcing sheet.
- D. Adhesives/Sealants: Provide manufacturer's standard adhesives and sealants for bonding flashing together, bonding flashing to substrate and sealing elastomeric seam edges.
- E. Protection Course: Provide manufacturer's recommended extruded polystyrene, rigid, insulating, drainage board.
- F. Filter Fabric Sheet: Provide manufacturer's recommended water permeable polymeric fabric.

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. Examine all surfaces to receive waterproofing membrane. Verify acceptability of substrate for proper installation of membrane. Do not commence work of this section until all substrate defects are corrected.

### 3.02 PREPARATION

- A. All surfaces must be dry, smooth, free of depressions, voids, protrusions, clean and free of unacceptable curing compounds, form release agents and other surface contaminants.
  - 1. Cast-in-Place Concrete: Concrete surfaces shall be monolithic, smooth, free of voids, spalled areas, laitance, honeycombs, and sharp protrusions.
- B. Cleaning: Thoroughly clean surface to receive membrane using methods approved by membrane manufacturer.
- C. Check: Apply test patch of membrane to substrate to check adhesion. Do not proceed with installation until testing reveals acceptable conditions.

### 3.03 MEMBRANE INSTALLATION

- A. Apply surface conditioner to concrete using hand held sprayer. Apply conditioner at a rate of 300 to 600 SF/gallon depending on surface texture. Surface conditioner should "tan" the surface, not blacken it.
  - 1. Allow sufficient time for surface conditioner to thoroughly dry prior to the membrane application.
- B. Membrane Preparation
  - 1. Heat membrane in double jacketed oil bath or hot air melter with mechanical agitation, specifically designed for the preparation of a rubberized asphalt membrane.
  - 2. Heat membrane until membrane can be drawn-free flowing at a temperature range between 350° F. and 400° F.
- C. Flashing: Install flashings as recommended by membrane manufacturer. Complete all flashings before installation of the membrane field.
- D. Membrane Application: Apply rubberized asphalt membrane at a rate to provide a continuous, monolithic coat of 180 mil minimum, but not less than 125 mil thickness.

#### 3.04 PROTECTION LAYER INSTALLATION

- A. Install protection sheet/rigid insulation board into the membrane while still hot to ensure proper bond.
- B. Overlap adjoining sheet edges (dry) a minimum 2"-3" to ensure complete coverage. Do not overlap rigid insulation board materials.
- C. Inspect installation for compliance with manufacturer's recommendations. Correct any deficiencies prior to backfilling.

#### 3.05 BACKFILLING

- A. Install gravel, filter fabric and French drain against protection board and membrane as indicated on the drawings and as recommended by the membrane manufacturer.
- B. Complete earth backfilling operation as specified in other sections.

**END OF SECTION**



**SECTION 07212**

**BOARD AND BATT INSULATION**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Board insulation and integral vapor retarder at perimeter foundation wall and underside of floor slabs.
- B. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.

1.02 RELATED SECTIONS

- A. Section 09260 - Gypsum Board Assemblies: Acoustic insulation.

1.03 REFERENCES

- A. ASTM C 552 - Standard Specification for Cellular Glass Thermal Insulation; 1991.
- B. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 1995.
- C. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 1995.
- D. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1996a.
- E. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 1996.
- F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; 1996.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Foamed Plastic Insulation: Minimize period between product delivery and actual installation. Protect against exposure to flame, sparks, or excessive heat. Minimize exposure to sunlight.

1.06 SEQUENCING

- A. Sequence work to ensure fireproofing and firestop materials are in place before beginning work of this section.

## PART 2 PRODUCTS

### 2.01 BOARD INSULATION MATERIALS

- A. Extruded Polystyrene Board Insulation: ASTM C 578, Type IV; Extruded expanded polystyrene board with cut cell surfaces; with the following characteristics:
  - 1. Board Size: 48 x 96 inch.
  - 2. Board Thickness at Wall Locations: 2 inches.
  - 3. Board Thickness at Roof Locations: 2-1/2 inches.
  - 4. Board Edges: Square.
  - 5. Thermal Conductivity (k factor) at 25 degrees F: 0.18.
  - 6. Compressive Resistance at Walls: 15 psi.
  - 7. Compressive Strength at Roof: 25 psi.
  - 8. Board Density: 1.3 lb/cu ft.
  - 9. Water Absorption, maximum: 0.3 percent, volume.
  - 10. Manufacturers:
    - a. Dow Chemical Co.
    - b. Owens Corning Corp.
    - c. Tenneco Building Products.
  - 11. Substitutions: See Section 01600 - Product Requirements.

### 2.02 BATT INSULATION MATERIALS

- A. Batt Insulation: ASTM C 665; preformed glass fiber batt; friction fit, conforming to the following:
  - 1. Thickness: As indicated on the drawings.
  - 2. Facing: Unfaced.
  - 3. Manufacturers:
    - a. CertainTeed Corp.
    - b. Johns Manville.
    - c. Owens Corning Corp.
  - 4. Substitutions: See Section 01600 - Product Requirements.

### 2.03 ACCESSORIES

- A. Sheet Vapor Retarder: Black polyethylene film reinforced with glass fiber square mesh, 2 mil thick.
- B. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
- C. Adhesive: Type recommended by insulation manufacturer for application.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

**3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER**

- A. Adhere a 6 inch wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
- B. Install boards horizontally on foundation perimeter.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

**3.03 BOARD INSTALLATION AT CAVITY WALLS**

- A. Adhere a 6 inch wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
  - 1. Tape seal joints between sheets.
  - 2. Extend sheet full height of joint.
- B. Apply adhesive to back of boards:
  - 1. Three continuous beads per board length.
  - 2. Full bed 1/8 inch thick.
- C. Install boards to fit snugly between wall ties.
- D. Install boards horizontally on walls.
- E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

**3.04 BATT INSTALLATION**

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.
- F. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
- G. Tape seal tears or cuts in vapor retarder.
- H. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

**3.05 PROTECTION OF FINISHED WORK**

- A. Do not permit installed insulation to be damaged prior to its concealment.

**3.06 SCHEDULES**

- A. Perimeter and Cavity Wall Insulation: Extruded polystyrene, bead adhesive application.

- B. Metal Framed Wall Insulation: Fiberglass batts with integral vapor barrier, taped to metal studs.

**END OF SECTION**

## SECTION 07 260 - VAPOR RETARDERS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Vapor Retarders: Materials to make concrete slabs water vapor-resistant. .

#### 1.02 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. Manufacturer's Installation Instructions: Indicate preparation, special procedures and perimeter conditions requiring special attention. Include storage and handling criteria.

#### 1.03 QUALITY ASSURANCE

- A. Vapor Permeability (Perm): Measure in accordance with ASTM E 96 Procedure E.

### PART 2 PRODUCTS

#### 2.01 SHEET SEAL MATERIALS

- A. Sheet Seal Type Vapor Retarder: 2 polyethylene films of thickness laminated with glass fiber or polypropylene net/fabric reinforcing, black color.
  - 1. Thickness: 8 mil.
  - 2. Maximum Vapor Permeability (Perm): 0.5 ng/S/m/pa.
  - 3. Product: Under slab reinforced polyethylene film #R8BBR manufactured by Raven Industries or approved equal.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this section.

#### 3.02 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.

**END OF SECTION**



## SECTION 07 411 - PREFORMED METAL ROOF PANELS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Structural roofing system of preformed steel panels.
- B. Architectural roofing system of preformed steel panels.
- C. Thermal roof insulation.
- D. Fastening system.
- E. Factory finishing.
- F. Accessories and miscellaneous components.

#### 1.02 RELATED SECTIONS

- A. Section 07900 - Joint Sealers: Field-installed sealants.

#### 1.03 REFERENCES

- A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2002.
- B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2004.
- C. ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; 2001.
- D. ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference; 1995 (Reapproved 2003).
- E. ASTM E 1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems; 1995 (Reapproved 2003).
- F. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; 1994.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
  - 1. Show work to be field-fabricated or field-assembled.
- C. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.
- D. Test Reports: Indicate compliance of preformed metal roofing system to specified requirements.
- E. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in the manufacture of roofing systems similar to those required for this project, with not less than 5 years of documented experience.
- B. Installer Qualifications: Company trained and authorized by roofing system manufacturer.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

#### 1.07 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Finish Warranty: Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of 5 year period from date of Substantial Completion.
- C. Waterproofing Warranty: Provide manufacturer's warranty for weathertightness of roofing system, including agreement to repair or replace roofing that fails to keep out water within specified warranty period of 5 years from date of Substantial Completion.

## **PART 2 PRODUCTS**

### **2.01 STRUCTURAL ROOF PANELS**

- A. Engineering: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed 1/180 of the span when tested in accordance with ASTM E 1592.
  - 1. Dead Loads: Weight of roofing system.
  - 2. Live Loads: As required by ASCE 7.
- B. Performance Requirements: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for conformance to the following minimum standards:
  - 1. General: Complete weathertight system tested and approved in accordance with ASTM E 1592.
  - 2. Wind Uplift: Class 90 wind uplift resistance of UL 580.
  - 3. Air Infiltration: Maximum 0.06 cfm/sq ft at air pressure differential of 6.24 lbf/sq ft, when tested according to ASTM E 1680.
  - 4. Water Penetration: No water penetration when tested according to procedures and recommended test pressures of ASTM E 1646. Perform test immediately following air infiltration test.
  - 5. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.
- C. Metal Roofing: Factory-formed panels with factory-applied finish.
  - 1. Steel Panels:
    - a. Steel Thickness: Minimum 0.024 inch.
  - 2. Texture: Smooth.
  - 3. Length: Maximum possible length to minimize lapped joints.
  - 4. Width: Maximum panel coverage of 16 inches.

### **2.02 ATTACHMENT SYSTEM**

- A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

### **2.03 PANEL FINISH**

- A. Fluoropolymer Coating System: Manufacturer's standard multi-coat thermocured coating system, including minimum 70 percent fluoropolymer color topcoat with minimum total dry film thickness of 0.9 mil; color and gloss to match existing adjacent building roof.

### **2.04 ACCESSORIES AND MISCELLANEOUS ITEMS**

- A. Miscellaneous Sheet Metal Items: Provide "Z" purlins, flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.
- B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish, closed-cell synthetic rubber, neoprene, or PVC, or combination steel and closed-cell foam.
- C. Sealants: As specified in Section 07900.
  - 1. Exposed sealant must cure to rubber-like consistency.
  - 2. Concealed sealant must be non-hardening type.

3. Seam sealant must be factory-applied, non-skinning, non-drying type.
- D. Thermal Insulation: Provide flexible blanket, rigid, or semi-rigid type, faced with white, flexible, non-dusting vapor retarder tested for maximum flame-spread rating of 50, per ASTM E 84; for installation using spacer blocks.
- E. Ice and water shield: Provide self adhering polymer modified bituminous membrane integrally bonded on one side to a polyethylene film.
  1. Acceptable Products:
    - a. Vycor Ice and Water Shield; Manufacturer: W.R. Grace and Company; [www.nagraceconstruction.com](http://www.nagraceconstruction.com)
    - b. JM Ice and Water Guard; Manufacturer: Johns Manville; [www.jm.com](http://www.jm.com).

#### 2.05 FABRICATION

- A. Panels: Fabricate panels and accessory items at factory, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.
- B. Joints: Factory-install captive gaskets, sealants, or separator strips at panel joints to provide weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

### PART 3 EXECUTION

#### 3.01 PREPARATION

- A. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.
- B. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.
- C. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

#### 3.02 INSTALLATION

- A. General: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
  1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
  2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.
- B. Accessories:
  1. "Z" purlins: Install "Z" purlins as recommended by the panel manufacturer for the intended substrate and load conditions
  2. Miscellaneous accessories: Install all components required for complete weathertight roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.
  3. Ice and water shield: Install membrane ice and water shield as recommended by the membrane manufacturer. Comply with manufacturer's recommended field conditions for installation. Provide sealant tape or other approved joint sealer at membrane joints.
  4. Install sealant or sealant tape, as recommended by panel manufacturer, at end laps and side joints.
- C. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.
  1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by the panel manufacturer.
  2. Incorporate concealed clips at panel joints, and apply snap-on battens to provide weathertight joints.
  3. Provide sealant tape or other approved joint sealer at lapped panel joints.
  4. Install sealant or sealant tape, as recommended by panel manufacturer, at end laps and side joints.

- D. Insulation: Install insulation between roof covering and supporting members to present a neat appearance. Fold, staple, and tape seams unless otherwise approved by Architect.
  - 1. Install rigid or semi-rigid insulation in areas exposed to view.

**3.03 CLEANING AND PROTECTION**

- A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.
- B. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.
- C. Touch-up, repair, or replace damaged roof panels or accessories before date of Substantial Completion.

**END OF SECTION**

## SECTION 07 550 - MODIFIED BITUMINOUS MEMBRANE ROOFING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Substrate preparation.
- B. Modified bituminous roofing membrane conventional application.
- C. Vapor retarders.
- D. Base flashings.
- E. Roofing cant strips

#### 1.02 RELATED SECTIONS

- A. Section 07 620 Sheet metal Flashing and Trim.

#### 1.03 REFERENCES

- A. ASTM C 612 – Standard Specification for Mineral Fiber Block and Board Thermal Insulation; Current Edition.
- B. ASTM C 726 – Standard Specification for Mineral Fiber Roof Insulation Board; Current Edition.
- C. ASTM D 41 – Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; Current Edition.
- D. ASTM D 312 – Standard Specification for Asphalt Used in Roofing; Current Edition.
- E. ASTM D 2822 – Standard Specification for Asphalt Roof Cement; Current Edition.
- F. NRCA ML 104 – The NRCA Roofing and Waterproofing Manual; National Roofing Contractors Association; Fourth Edition.
- G. UL RMSD – Roofing Materials and Systems Directory; Underwriters' Laboratories, Inc. ; Current Edition.

#### 1.04 PERFORMANCE REQUIREMENTS

- A. Fire Resistance: Provide roofing system materials and roof system assembly which have been tested and are listed in the U.L. "Roofing Materials and Systems Directory" as being acceptable for the following external fire exposure rating:
  - 1. Provide roof system listed for U.L. Class A exposure.

#### 1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating membrane and bitumen materials and base flashing materials.
- C. Manufacturer's Installation Instructions: Indicate special procedures as provided by the manufacturer in writing.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Field Reports: Indicate procedures followed for roofing assembly installation.
- F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

#### 1.06 QUALITY ASSURANCE

- A. Perform work in accordance with NRCA Roofing and Waterproofing Manual.
- B. U.L. Label: Roofing material packaging shall bear U.L. classification marking.

- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- D. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years experience and recognized by the manufacturer as an approved installer.

**1.07 PRE-ROOFING MEETING**

- A. Organize and conduct a meeting at the construction site 2 weeks prior to the scheduled start of roof system installation with roofing installer; installer of each component of related work, including deck or substrate construction, roof equipment, penetrations of roof deck, and other work integral with or adjacent to roofing; the Architect; the Owner; the roofing manufacturer's representative; and other parties involved with the roofing system performance including Owner's Insurance representative, independent testing representative, independent testing agencies, and governing authorities.
  - 1. Walk roof areas to review and discuss substrate preparation including repair of unacceptable surfaces, roof drainage, penetrations, equipment curbs, and work performed by other trades which requires coordination with roofing system.
  - 2. Examine steel deck for proper flatness and slop, review structural capability for supporting roofing systems and methods of fastening.
  - 3. Review contract document requirements and submittals for roofing system, including roofing schedule, inspection and testing, stopping off the work, and environmental conditions. Identify what are considered unacceptable weather conditions for roofing, and which governing regulations or insurance requirements will affect roofing system installation.
  - 4. Document discussions in writing, including actions required, and distribute copy of report to each meeting participant.

**1.08 DELIVERY, STORAGE, AND PROTECTION**

- A. Deliver products in manufacturer's original; containers, dry, undamaged, with seals and labels intact.
- B. Store products in weather protected environment, clear of ground and moisture.

**1.09 PROJECT CONDITIONS**

- A. Coordinate the work with installation of associated counterflashings installed by other sections as the work of this section proceeds..

**1.10 ENVIRONMENTAL REQUIREMENTS**

- A. Begin roofing installation when weather conditions are within acceptable limits according to the manufacturer's installation instructions and warranty requirements.

**1.11 WARRANTY**

- A. See Section 01780 – Closeout Submittals, fro additional warranty requirements.
- B. Project Installation Guarantee; Submit written agreement signed by installer and the contractor, guaranteeing to correct failures in product and workmanship for 10 (ten) years from the date of substantial completion, without reducing or otherwise limiting other rights to correction which the Owner may have under the contract documents. Failure is defined to include product failure which leads to interruption of a water-tight installation. Guarantee shall cover work of this section including:
  - 1. Roof membrane.
  - 2. Base Flashing.
  - 3. Roof Accessories.
- C. Manufacturer's Product Warranty: Submit manufacturer's standard limited product warranty signed by the manufacturer's authorized official, guaranteeing to correct failures in product which may occur during the warranty period, without reducing or otherwise limiting any other rights the Owner may have under the contract documents, for the period of time:
  - 1. Ten (10) years after the date of substantial completion with no dollar limit.
- D. Provide ten (10) year manufacturer's material and labor warranty to cover failure to prevent penetration of water.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Roof System:
  - 1. Project design and contract documents are based on the following: Firestone SBS I-M33\_M; Firestone Building Products.
- B. Manufacturers: Products of the following manufacturers, provided they comply with requirements of the contract documents, will be considered for substitution under the provisions of the conditions of the contract and Division 1:
  - 1. Celotex Corporation.
  - 2. GAF Building Materials Corporation
  - 3. Nord Bitumi U.S., Inc.
  - 4. Siplast, Inc.

**2.02 SHEET MATERIALS**

- A. Modified Bituminous Sheet, Smooth Surface: Preformed fiberglass mat coated on both sides with roofing grade asphalt.
- B. Modified Bituminous Sheet, Granular Surface: Preformed sheets of reinforced modified SBS rubber asphalt for hot asphalt application
  - 1. Top surface: Mineral granules; white color.
- C. Flashing Sheet: Same as roofing membrane sheet.

**2.03 BITUMINOUS MATERIALS**

- A. Asphalt: ASTM D 312, Type IV.
  - 1. EVT Temperature: +/- 25 degrees F. or 400 degrees F. whichever is greater at the point of application.

**2.04 ACCESSORIES**

- A. Fasteners: Galvanized steel, fluoropolymer coated steel, or nonferrous metal. Size, length, and type recommended by manufacturer as suitable for material to be fastened, substrate, and that will comply with requirements of governing authorities and listing agencies.
- B. Sealant: One-component urethane, nonsag, compatible with membrane and flashing materials.
- C. Nailers and Blocking: Fabricate from treated wood as specified in Division 8.
- D. Roof drain flashing: 2-1/2 pound to 4 pound lead sheet.
- E. Walkways: Roofing membrane manufacturer's granule surfaced modified bituminous sheet intended for use as a protection course for foot traffic:
  - 1. Location: From all roof scuttles to all curb mounted components; 36" wide.
- F. Prefabricated Cant and Edge Strips: Asphalt-impregnated wood fiberboard, compatible with roofing materials; cants formed to 45 degree angle.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.

- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

### 3.02 INSTALLATION

- A. Schedule inspections and field tests required for roofing system with independent testing agencies, and cooperate with testing agency personnel during field visits.
- B. Prevent roofing materials from damaging or spilling on adjacent construction. Replace adjacent materials damaged by roofing system installation.
- C. Interruptions of Roofing Work:
  - 1. Provide cutoffs at end of each day's work. Cover exposed insulation and water-permeable materials with a course of roofing sheet. Seal joints and edges with roofing cement. Remove cutoffs immediately before resuming work.
- D. Installation of Roofing Sheets:
  - 1. Follow manufacturer's recommendations for installation to ensure proper installation of sheet without irregularities such as fishmouths or wrinkles.
  - 2. Place and press sheets during installation to ensure proper adhesion to substrate and adjacent roofing sheet..
  - 3. Comply with manufacturer's recommendations to ensure that joints are solidly adhered and weathertight.

### 3.03 MEMBRANE APPLICATION

- A. Apply membrane in accordance with manufacturer's instructions:
- B. Apply membrane; lap and seal edges with asphalt.
- C. At intersections with vertical surfaces:
  - 1. Extend membrane over cant strips and up a minimum of 8 inches onto vertical surfaces.
  - 2. Apply flexible flashing over membrane.
- D. Around roof penetrations, mop in and seal flanges and flashings with flexible flashing.
- E. Coordinate installation of roof drains and sumps and related flashings.
- F. Flexible Sheet Walkways: Cut sheets into approximately 10 to 12 foot lengths, 36 inches wide and allow to "relax" for approximately 30 minutes before installing. Embed sheet in a solid mopping of roofing bitumen or adhesive.

### 3.04 CLEANING

- A. Remove bituminous markings from finished surfaces.
- B. In areas where finished surfaces are soiled by bitumen or other source of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
- C. Repair or replace defaced or damaged finishes caused by work of this section.

### 3.05 PROTECTION OF FINISHED WORK

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

**END OF SECTION**

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## SECTION 07 614 - METAL CANOPIES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Prefinished metal canopy system

#### 1.02 REFERENCES

- A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 1998.
- B. ASTM A 755/A 755M - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil Coating Process For Exterior Exposed Building Products; 1996.

#### 1.03 DESIGN REQUIREMENTS

- A. Maximum Allowable Deflection of Panel: 1/90 of span.
- B. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
- C. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate dimensions, layout, joints, construction details, methods of anchorage.
- C. Samples: Submit three samples of wall panel, 12 inch by 12 inch in size illustrating finish color, sheen, and texture.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer: Company specializing in performing the work of this section with minimum five years of experience.

#### 1.06 DELIVERY, STORAGE, AND PROTECTION

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- B. Store prefinished material off ground and protected from weather. Prevent twisting, bending, or abrasion, and provide ventilation to stored materials. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials that may cause discoloration or staining of products.

#### 1.07 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

- B. Correct defective work within a 20 year period after Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.
- C. Correct defective Work within a five year period after Substantial Completion, including defects in water tightness and integrity of seals.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Alumax Building Specialties Division; Product Overhead Suspension Canopy SD-210.
- B. Other Acceptable Manufacturers:
  - 1. Centria.
  - 2. Reynolds Metal Co.
  - 3. Substitutions: See Section 01600 - Product Requirements.

### **2.02 EXTERIOR PANEL MATERIALS**

- A. Prefinished Galvanized Sheet Steel: ASTM G90/Z275 Forming Steel (FS) Coating Designation; shop precoated in accordance with ASTM A755/A755M using Kynar 500 coating system.
  - 1. Size: 12" wide blade and scabbard snap-lock interlocking design
  - 2. Gauge: 24 gauge
  - 3. Color: Manufacturer's standard Kynar finish in color as selected by the Architect.
- B. Fascia
  - 1. 6" extruded 6063-T6 aluminum with serrated face designed to receive two optional 2" wide colored trim slats. The fascia shall be load bearing design, 6" high with continuous integral water gutter width of 3-1/2"
- C. Posts, Columns, Beams
  - 1. Beams shall be extruded aluminum 6061-T6, 7" I profile clear anodized.

### **2.03 ACCESSORIES**

- A. Splices, corners, and water outlets shall be as detailed and recommended by the manufacturer.
- B. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.
- C. Field Touch-up Paint: As recommended by panel manufacturer.

### **2.04 FABRICATION**

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest practicable lengths.
- C. Fabricate corners in one continuous piece with minimum 18 inch returns.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that building framing members are ready to receive panels.

3.02 INSTALLATION

- A. Install canopy system as recommended by the manufacturer.
- B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.
- C. Fasten panels to structural supports; aligned, level, and plumb.
- D. Locate joints over supports. Lap panel ends minimum 2 inches.
- E. Use concealed fasteners unless otherwise approved by Architect.
- F. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.03 CLEANING

- A. Remove site cuttings from finish surfaces.
- B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

**END OF SECTION**



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## SECTION 07 620 - SHEET METAL FLASHING AND TRIM

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Flashings, counterflashings and fabricated sheet metal items.

#### 1.02 RELATED SECTIONS

#### 1.03 REFERENCES

- A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 1996.
- B. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 1995.
- C. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 1993.
- D. FS TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant; Federal Specifications and Standards; Revision B, 1985.
- E. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 1993, Fifth Edition.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's technical information and installation instructions, in sufficient detail to demonstrate products comply with contract documents.
- C. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- D. Samples: Submit 6 inch x 6 inch square sample of each type of metal and finish required.

#### 1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.

### PART 2 PRODUCTS

#### 2.01 SHEET MATERIALS

- A. Pre-Finished Aluminum: ASTM B 209 (ASTM B 209M); 0.032 inch thick; plain finish shop pre coated with fluoropolymer coating of color as selected.

#### 2.02 ACCESSORIES

- A. Fasteners: Galvanized steel, with soft neoprene washers.
- B. Primer: Zinc chromate type.
- C. Protective Backing Paint: Zinc chromate alkyd.

- D. Sealant: Type as specified in Section 07900.
- E. Plastic Cement: ASTM D 4586, Type I.
- F. Manufactured Expansion Joint Covers: Type FR-525, prefinished aluminum in manufacturer's standard color as selected by the Architect; manufactured by Balco Metalines.
  - 1. Substitution: See Section 01630-Product Options and Substitutions.
- G. Manufactured Soffit Panels:
  - 1. Material: .040 Aluminum
  - 2. Finish: Smooth texture, fluoropolymer coating from manufacturer's standard colors.
  - 3. Product: Opaline Profiles, model OPF040 (4 inch slat); manufactured by ATAS International, Incorporated.
  - 4. Accessories: Match gage and finish of panel material.
  - 5. Substitution: See Section 01630-Product Options and Substitutions.

### 2.03 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- F. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.
- G. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

### 3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

- A. Secure flashings in place using concealed fasteners.
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Seal metal joints watertight.
- E. Prefabricated Materials:
  - 1. Install prefabricated materials and accessories as recommended by the manufacturer and as indicated on the drawings.

**END OF SECTION**



## SECTION 07 631 - GUTTERS AND DOWNSPOUTS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Pre-finished aluminum gutters and downspouts.

#### 1.02 REFERENCES

- A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 1996.
- B. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 1995.
- C. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 1993, Fifth Edition.

#### 1.03 DESIGN REQUIREMENTS

- A. Conform to SMACNA Architectural Sheet Metal Manual for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.
- B. Conform to applicable code for size and method of rain water discharge.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

#### 1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.
- B. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

#### 1.06 PROJECT CONDITIONS

- A. Coordinate the work with downspout discharge pipe inlet.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Pre-Finished Aluminum Sheet: ASTM B 209 (ASTM B 209M); 0.032 inch thick.
  - 1. Finish: Plain, shop pre-coated with modified silicone coating.
  - 2. Color: To match roofing panel system.

**2.02 COMPONENTS**

- A. Gutters: Profile as indicated on the drawings.
- B. Downspouts: SMACNA Rectangular profile.
- C. Anchors and Supports: Profiled to suit gutters and downspouts.
  - 1. Anchoring Devices: In accordance with SMACNA requirements.
  - 2. Gutter Supports: Brackets.
  - 3. Downspout Supports: Brackets.

**2.03 ACCESSORIES**

- A. Downspout Boots: Plastic.

**2.04 FABRICATION**

- A. Form gutters and downspouts of profiles and size indicated.
- B. Fabricate with required connection pieces.
- C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- D. Hem exposed edges of metal.
- E. Fabricate gutter and downspout accessories; seal watertight.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install gutters, downspouts, and accessories.
- B. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories. Provide expansion joints of type and quantity as recommended by SMACNA.
- C. Slope gutters 3/16 inch per foot.
- D. Connect downspouts to downspout boots at 2 inches above grade. Grout connection watertight.

**END OF SECTION**

## SECTION 07 724 - ROOF HATCHES AND VENTS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Prefabricated roof hatches and vents, with integral support curbs, operable hardware, and counterflashings.

#### 1.02 RELATED SECTIONS

- A. Section 05500 - Metal Fabrications

#### 1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on unit construction, sizes, configuration, jointing methods and locations when applicable, and attachment method.
- C. Manufacturer's Installation Instructions: Indicate special installation criteria, interface with adjacent components.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Roof Hatches and Vents:
  - 1. Babcock-Davis Hatchways, Inc.
  - 2. BilcoCo.; Product Type "S".
  - 3. Dur-Red Products.
  - 4. Milcor Inc.
  - 5. Substitutions: See Section 01600 - Product Requirements.

#### 2.02 ROOF HATCHES

- A. Unit: Single leaf type.
  - 1. 30x54 (hinge side) inch size.
- B. Integral Steel Curb: 14 gage galvanized steel with 1 inch rigid glass fiber insulation; integral cap flashing to receive roof flashing; extended flange for mounting.
- C. Flush Steel Cover: 14 gage galvanized steel; 1 inch glass fiber insulation; 22 gage steel interior liner; continuous neoprene gasket to provide weatherproof seal.
- D. Metal Finishes: Manufacturer's standard red oxide primer for field painting.
- E. Hardware: Cadmium plated finish:
  - 1. Compression spring operator and shock absorbers.
  - 2. Steel manual pull handle for interior operation.
  - 3. Steel hold open arm with vinyl covered grip handle for easy release.
  - 4. Padlock hasp on interior.
  - 5. Hinges: Manufacturer's recommended type.
  - 6. Assist Pole: Provide manufacturer's standard telescoping assist pole for access to and from roof.

**2.03 ROOF VENTS**

- A. Unit: Double leaf type, listed by UL.
  - 1. Size as indicated on the drawings.
  - 2. Integral Steel Curb: 14 gage galvanized steel with 1 inch rigid glass fiber insulation; integral cap flashing to receive roof flashing; extended flange for mounting.
  - 3. Flush Steel Cover: 14 gage galvanized steel; 1 inch glass fiber insulation; 22 gage steel interior liner; continuous neoprene gasket to provide weatherproof seal.
  - 4. Metal Finishes: Manufacturer's standard red oxide primer for field painting.
  - 5. Hardware: Cadmium plated finish:
    - a. Compression spring operator and shock absorbers.
    - b. Automatic opening upon break of 160 degree F fusible link.
    - c. Automatic opening upon activation of fire alarm system.
    - d. Hinges: Manufacturer's recommended type.

**2.04 FABRICATION**

- A. Fabricate components free of visual distortion or defects. Weld corners and joints.
- B. Provide for removal of condensation occurring within components or assembly.
- C. Fit components for weather tight assembly.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Coordinate with installation of roofing system and related flashings for weather tight installation.
- C. Apply bituminous paint on surfaces of units in contact with cementitious materials or dissimilar metals.
- D. Adjust hinges for smooth operation.

**END OF SECTION**

## SECTION 07 840 - FIRESTOPPING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Firestopping materials for complete installation in penetrations consisting of pipe, duct, cable, other electrical devices, or blank openings in fire-rated walls, floors and partitions.
- B. Membrane penetration protection for fire-rated walls.
- C. Firestopping of all penetrations and interruptions to fire rated assemblies, whether indicated on drawings or not, and other openings indicated.

#### 1.02 RELATED SECTIONS

- A. Section 03 300: Cast-in-Place Concrete.
- B. Section 04 420: Concrete Unit Masonry.
- C. Section 06 100: Rough Carpentry.
- D. Section 07 210: Building Insulation.
- E. Section 09 260: Gypsum Board Assemblies.
- F. Division 15: Mechanical.
- G. Division 16: Electrical.

#### 1.03 REFERENCES

- A. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2000a.
- B. ASTM E 814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2002.
- C. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.
- D. UL 2079: Tests for Fire Resistance of Building Joint Systems; current edition.

#### 1.04 DEFINITIONS

- A. Terms:
  - 1. Alpha-Alpha-Numeric system for penetration identification: UL 1993 system to universally identify and categorize penetrations.
    - a. First Alpha Grouping: Designate penetration type; "F" for floors, "W" for walls; "C" for either or both floors and walls.
    - b. Second Alpha Grouping: Further designates significant assembly characteristics; "A" for concrete floors with minimum thickness less than or equal to 5", "J" for concrete or masonry walls with minimum thickness less than or equal to 8".
    - c. Numeric Grouping: Designates penetrating item; 1000-1999 for metal pipe, conduit, or tubing; 5000-5999 for insulated pipes.
    - d. Example: Assembly F-A-5001 means: (F) floor penetration - (A)concrete substrate less than or equal to 5"- (5001) Insulated pipes.
  - 2. Construction Gap: Gap, joint, or opening, whether static or dynamic, where top of wall may meet floor; wall to wall applications; edge to edge floor configurations; floor to exterior wall; or linear breach in rated barrier.
  - 3. Fire Rated: Having ability to withstand effects of fire for specified time period, as determined by qualified testing.
  - 4. Fire Rated Assembly: Multi-component floor, wall, or partition having ability to withstand design fire and hose stream test without failure.
  - 5. Fire Resistance Rating: Time, in hours, for which rated assembly can withstand effects of fire without burn-through or structural failure.
  - 6. Firestop (verb): Sealing openings in fire-rated assemblies to preserve or restore fire resistance rating.
  - 7. Firestop System or "System": Combination of materials or devices, including penetratin items, required to make up complete firestop.

8. Intumescent: Having the ability to enlarge, swell or expand with heat.
9. Membrane Penetration: Penetration of fire-rated wall or floor breaching only one side of barrier.
10. Penetrating Item: Pipe, duct, conduit, cable tray, cable, or other element passing through opening in fire rated assembly.
11. Through Penetration: Penetration of fire-rated wall or floor completely breaching barrier.
12. VOC: Volatile Organic Compound(s).

#### 1.05 SYSTEM DESCRIPTION

- A. Design Requirements:
  1. Designs selected for installation: Provide fire resistance rating at least equal to hourly resistance rating of floor, wall, or partition into which firestop design is installed.
  2. Firestop systems and materials:
    - a. Not require special tools for installation.
    - b. Do not emit hazardous,combustible, or irritating fumes during installation, curing, or use.
  3. When more than one firestop design is applicable, evaluate individual product characteristics for secondary benefits in performance, e.g., environmental/water sealing or ease of installation or modification.
- B. Performance Requirements:
  1. Fire and hose stream on material: Meet or exceed requirements of ASTM E814 for F (flame) Rating or T (temperature) Rating required by local code.
  2. Fire Tests - ASTM E119: Pass requirements when used in assembly.
  3. Firestop systems do not reestablish the structural integrity of load bearing partitions. Consult Architect before drilling or coring any load bearing assembly.
  4. Firestop systems are not intended to support live loads or traffic. Curbs or steel plates may be required to restrict or accommodate potential traffic. Notify the Architect in writing if any of these limitations may be violated.
  5. Comply with UL 2079 where dynamic movement is anticipated.

#### 1.06 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data:
  1. Complete list of products for use; indicate compliance with VOC limits.
  2. Data for fire or smoke rated insulation; indicate complete installation instructions for maintaining ratings of wall or floor assemblies to meet code requirements.
- C. Shop Drawings: Complete schedule of rated penetrations, locations, and proposed rated materials to fill penetrations in accordance with certified testing laboratory designs and alphanumeric system, e.g., UL-Alpha-Numeric system.
- D. Quality Control Submittals:
  1. Certificates:
    - a. Indicate materials supplied or installed are asbestos free.
    - b. Indicate compliance with applicable VOC limits.
  2. Test Reports: Products supplied; indicate recognized laboratory test results for same type conditions encountered on project.
  3. Manufacturer's Instructions:
    - a. Exact procedures for installation fo rated firestop material to maintain wall, floor, or combination assemblies ratings; indicate penetration hole/pipe size relationship, if required, for clearances to obtain results same as tested assemblies.
    - b. Disposal requirements for expended material or partially expended containers.
- E. Closeout Submittals:
  1. Project Record Documents: Completion and inspection reports in FIELD QUALITY CONTROL article.

#### 1.07 QUALITY ASSURANCE

- A. Installer Qualifications:
  1. Certified by firestop materials manufacturer; include original certification date, recertification dates, as applicable, and names of individuals trained from installer's staff.

2. Completed five Projects, minimum, of comparable magnitude using specified system in last three years.
3. Submit project reference list for review and verification; non-verifiable projects will be cause for installer rejection.

**1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Storage and Protection: Dispose of expended or partially expended materials and material containers in accordance with EPA requirements.

**1.09 SEQUENCING AND SCHEDULING**

- A. Additional firestopping requirements may be created by construction activities specified in other sections.
  1. Identify locations requiring firestopping.
  2. Schedule and coordinate firestopping installation after completion of duct. piping, electrical runs, and prior to covering openings or eliminating access.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. General
  1. Products of manufacturers indicated below may be used singly or in combination to meet ratings of adjacent wall, floor, or perimeter.
  2. Using product or products singly or in combination requires recognized testing laboratory test results for indicated application; system selection is optional unless testing requires use of one particular type.
  3. Intent is to maintain rated integrity of the following:
    - a. Wall, floor, or ceiling at penetrations providing 40% tensile elongation and compression where penetrating item is carrying hot/cold liquids/gases or attached to vibrating machinery.
    - b. Floor, regardless of moisture and water exposure using silicone based sealing materials at penetrating items.
  4. No ampacity de-rating of cable at penetrations.
  5. reviewed schedule indicates insulation type or types and locations used.
  6. Penetrations, smoke and fire fall into two categories:
    - a. Not requiring intumescent qualities.
    - b. Requiring intumescent qualities, such as PVC pipe or other dissolving materials.
- B. Acceptable Manufacturers
  1. Putty, mortar, re-entry type, sealants, wrap strip, foam, composite board, spray applied mastic, elastomeric spray film, fire blocks, cast-in-place devices, and metal collar/cuff assemblies:
    - a. Flame Stop, Inc.
    - b. Hilti, Inc.
    - c. Isotek International Corp.
    - d. Nelson Firestopn Products, Inc.
    - e. Rectorseal, Inc.
    - f. Specified Technologies, Inc.
    - g. 3M Company/Construction Markets Division.
    - h. Tremco, Inc.
    - i. USG Company.
    - j. W.R. Grace and Company.
  2. Safing Insulation:
    - a. Acceptable products:
      - 1) Fibrex; FBX Safing Insulation.
      - 2) Thermafiber, LLC; Thermafiber Safing Insulation.
    - b. Characteristics:
      - 1) Composition: ASTM C612-83, Class 3, semi-rigid to rigid mineral fiber boards.
      - 2) Density: Four PCF, nominal.
      - 3) Thickness: Required for penetration rating.
      - 4) Combustibility: ASTM E136-82, noncombustible.
      - 5) Flame Spread: ASTM E84-87, maximum.
    - c. Accessories: Thermafiber. Llc 12 guage Snap-On Clip Type A or Prong Clip Type D standard

- impaling clips or similar clips of other manufacturers code approved for use.
- 3. Accessories:
  - a. Furnish damming materials and other materials for installation.
  - b. Permanent labels to identify penetration with space for name of installing company, date installed, and UL or ITS/WHI penetration designation.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verification of Conditions:
  - 1. Verify that penetrating elements and supporting devices have been installed and temporary lines have been removed.
  - 2. Verify partitions receiving firestopping materials have required verbiage above ceiling line indicating fire partition, smoke partition, or area wall required by local code. Notify Architect, in writing, indicating compliance or non-compliance.

#### **3.02 PREPARATION**

- A. Clean surfaces in contact with penetration seal materials of dust, dirt, grease, oil, loose materials, rust, and other substances.

#### **3.03 INSTALLATION**

- A. General:
  - 1. Install firestopping materials in accordance with tested configurations; system selection is optional unless testing requires use of one particular type.
  - 2. Locations, general:
    - a. Cavities of floor-to-floor penetrations; include spaces around conduit, cable, piping, and duct penetrations.
    - b. Rated wall and ceiling penetrations; include spaces around conduit, cable, electrical boxes, piping, and duct penetrations.
    - c. Vertical service shaft penetrations.
    - d. Openings where fire rated walls terminate at metal floor or roof deck.
    - e. Membrane penetration protection for fire rated walls.
    - f. Top of wall and construction joint smoke-stopping on smoke partitions.
    - g. Top of wall firestopping in fire-rated partitions.
    - h. Construction joint firestops within walls, floors, or intersection of floors to exterior walls, or intersection of top of walls to ceilings.
    - i. Other locations indicated or required to maintain rated assembly integrity.
  - 3. Follow manufacturer's recommendations to obtain a smooth, professional finish.
  - 4. Remove forms or damming material, if used, after designated cure time unless support materials used are fire resistant or noncombustible nature.
  - 5. Reviewed submittal schedule indicates type or types firestopping used and actual locations.
- B. Install permanent labels at each penetration, in conspicuous location on pipe, duct, or other hard surface; indicate "WARNING - DO NOT DISTURB, UL ASSEMBLY CONFIGURATION INSTALLED, RATINGS, DATE INSTALLED, INSTALLING COMPANY, and INSTALLER."

#### **3.04 INSPECTION**

- A. Inspect the following:
  - 1. Penetration seals inspected by a third party recognized firestopping inspection/testing firm for correct installation, adhesion, and curing appropriate for respective seal materials.
  - 2. Inspection/Testing firm fees included in contract sum.
  - 3. Keep areas of firestopping work accessible; notify code authorities and designated inspection/testing firm, in writing, of work released for inspection.
  - 4. Document completion and inspection; file completion and inspection reports with Project Closeout Documents.

#### **3.05 ADJUSTING**

- A. Repairs and modifications:

1. Identify damaged or re-entered seals requiring repair or modification.
2. Remove loose or damaged materials.
3. If penetrating elements are to be added, remove enough material to insert new elements being careful not to cause damage to balance of seal.
4. Ensure surfaces to be sealed are clean and dry.
5. Install materials in accordance with materials approved by manufacturer as suitable for repair of original seal.

**END OF SECTION**



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## SECTION 07 900 - JOINT SEALERS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Sealants and joint backing.
- B. Precompressed foam sealers.
- C. Joints of a nature similar to that of joints indicated on the schedule shall be sealed with same sealer, whether indicated on the drawings to be sealed or not.

#### 1.02 RELATED SECTIONS

- A. Section 07840 - Firestopping: Firestopping sealants.
- B. Section 08800 - Glazing: Glazing sealants and accessories.
- C. Joint sealers in roofing work: Elsewhere in Division 7.
- D. Joint sealers in mechanical work: Division 15.
- E. Joint sealers in electrical work: Division 16.

#### 1.03 REFERENCES

- A. AAMA 800 - Voluntary Specifications and Test Methods for Sealants; Architectural Aluminum Manufacturers Association; current edition.
- B. ASTM C 719 - Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle); 1993.
- C. ASTM C 834 - Standard Specification for Latex Sealants; 1995.
- D. ASTM C 919 - Standard Practice for Use of Sealants in Acoustical Applications; 1984 (Reapproved 1992).
- E. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 1995.
- F. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 1991 (Reapproved 1995).
- G. ASTM D 1667 - Standard Specification for Flexible Cellular Materials--Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam); 1976 (Reapproved 1990).

#### 1.04 DEFINITIONS

- A. Substrates:
  - 1. M-type substrates: Concrete, concrete masonry units, brick, mortar, or natural stone. The term "masonry" shall mean brick, stone, and concrete masonry work.
  - 2. G-type substrates: Glass and transparent plastic glazing sheets.
  - 3. A-type substrates: Metals, porcelain, glazed tile, and smooth plastics.
  - 4. O-type substrates: Wood, unglazed tile, and substrates not included under other categories.
  - 5. NT-type substrates: Surfaces not exposed to vehicular or pedestrian traffic.
  - 6. T-type substrates: Surfaces exposed to vehicular or pedestrian traffic.
- B. Sealing: Making exterior and interior construction voids, junctions, or joints, air tight, dust tight, and water

tight.

- C. Joint Failure: A sealed joint exhibiting one or more of the following:
  - 1. Air or water, or both, infiltration or leakage.
  - 2. Dust infiltration.
  - 3. Sealant material migration.
  - 4. Loss of adhesion to bonded surfaces.
  - 5. Bonding of sealer to joint filler material or bond breaker material.
  - 6. Loss of cohesion.
  - 7. Discoloration or fading.
  - 8. Staining or marring of adjacent work or materials.

#### 1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, and instructions for installation.
- C. Samples: Submit three cured samples of actual products, 1x6 inch in size illustrating manufacturer's full range of sealant colors for selection. (Products exposed to view only).
- D. Certified Product Test Reports: Independent testing agency reports showing compliance with all specified requirements.
  - 1. Reports may be on tests conducted up to 24 months before submission, provided the products tested were aged specimens of the same formulation as that to be used.
- E. Certificates: For each sealer, provide manufacturer's certificate stating that the product complies with the specifications and is appropriate for the use intended.

#### 1.06 QUALITY ASSURANCE

- A. Maintain one copy of each referenced document covering installation requirements on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- C. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years experience.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original containers or bundles with labels showing manufacturer, product name or designation, color, shelf life, and installation instructions.

#### 1.08 ENVIRONMENTAL REQUIREMENTS

- A. Use only low-VOC emitting compounds.
- B. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.
- C. Do not install sealers if any of the following conditions exist:
  - 1. Air or substrate temperature exceeds the range recommended by the sealer manufacturer or is below 40 degrees F.
  - 2. Substrate is wet, damp, or covered with snow, ice, or frost.
  - 3. Dimensional Limitations: Do not install sealers if joint dimensions are less than or greater than that recommended by sealer manufacturer; notify the Architect and get sealer manufacturer's recommendations for alternative procedures.

1.09 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work or joint failures within a five year period after Date of Substantial Completion. Correction is limited to replacement of sealers.
- C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, do not cure or fail in any manner previously defined.
  - 1. Submit warranty in writing signed by the Contractor, and installer.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS

- A. Silicone Sealants:
  - 1. Bostik.
  - 2. Dow Corning Corp.
  - 3. GE Silicones.
  - 4. Pecora Corp.
  - 5. Substitutions: See Section 01600 - Product Requirements.
- B. Polyurethane Sealants:
  - 1. Bostik.
  - 2. ChemRex (Master Builders).
  - 3. Pecora Corp.
  - 4. Sonneborn Building Products.
  - 5. Tremco, Inc.
  - 6. Substitutions: See Section 01600 - Product Requirements.
- C. Polysulfide Sealants:
  - 1. Morton International, Inc.
  - 2. Pecora Corp.
  - 3. Sonneborn Building Products, ChemRex, Inc.
  - 4. Substitutions: See Section 01600 - Product Requirements.
- D. Acrylic Sealants:
  - 1. Tremco, Inc.
  - 2. Pecora Corp.
  - 3. Koch Protective Treatments, Inc.
  - 4. Substitutions: See Section 01600 - Product Requirements.
- E. Butyl Sealants:
  - 1. Bostik.
  - 2. TEC Incorporated.
  - 3. Tremco, Inc.
  - 4. Substitutions: See Section 01600 - Product Requirements.
- F. Acrylic Emulsion Latex Sealants:
  - 1. Bostik.
  - 2. Pecora Corp.
  - 3. Sonneborn Building Products.
  - 4. Tremco, Inc.
  - 5. Substitutions: See Section 01600 - Product Requirements.
- G. Preformed Compressible Foam Sealers:
  - 1. Emseal Joint Systems, Ltd.

2. Sandell Manufacturing Company, Inc.
3. Polytite Manufacturing Corporation.
4. Substitutions: See Section 01600 - Product Requirements.

## 2.02 ELASTOMERIC SEALANTS

- A. Elastomeric Sealants - General: Chemically curing elastomeric sealants of types indicated, complying with ASTM C 920, including specific Type, Grade, Class, and Uses indicated, as well as all other requirements specified.
1. Where movement capability exceeding that measured by ASTM C 920 is specified, sealant shall withstand the total movement indicated while remaining in compliance with other requirements specified, when tested in accord with ASTM C 719, with base joint width measured at the time of installation.
  2. M-type substrates: Comply with requirements for Use M.
  3. G-type substrates: Comply with requirements for Use G.
  4. A-type substrates: Comply with requirements for Use A.
  5. O-type substrates: Comply with requirements for Use M (minimum) and Use O for the particular substrate.
- B. Polysulfide Sealants:
1. Two-part Nonsag, Type M, Grade NS, Class 12-1/2, Use NT.
  2. Two-part Pourable, Type M, Grade P, Class 12-1/2, Use T
  3. Water Immersible: Type M, Grade NS, Class 12-1/2, Use T, specifically recommended by the manufacturer for sealing joint immersed continuously in water.
- C. Silicone Sealants:
1. High Movement: One- or two-part, non-acid-curing, Grade NS, Class 25, Use NT, plus movement capability of at least 50 percent in both extension and compression.
  2. Medium Movement: One- or two-part non-acid-curing, Grade NS, Class 25, Use NT, plus movement capability of more than 25 percent but less than 50 percent in both extension and compression.
  3. High Strength: One-part, acid- or non-acid-curing, Grade NS, Class 25, Use NT, with not over plus or minus 30 percent movement capability.
  4. Mildew-Resistant: One-part, Type S, Grade NS, Class 25, Use NT, formulated with fungicide, for interior use on nonporous substrates.
  5. Use T: One-part, non-acid-curing, Type S, Grade NS, Class 25, Use T, Use M, plus movement capability of 50 percent in both extension and compression.
- D. Urethane Sealants:
1. All-Purpose: Multipart, nonsag, Type M, Grade NS, Class 25, Uses NT, M, G, and A.
  2. Multipart Nonsag: Type M, Grade NS, Class 25, Uses NT, M, and A.
  3. Two-Part Nonsag Low-Modulus: Type M, Grade NS, Class 25, Use NT, plus movement capability of 50 percent in both extension and compression.
  4. Multipart Pourable: Type M, Grade P, Class 25, Use T.
  5. Nonsag for Use T: Type S or M, Grade NS, Class 25, Use T.
  6. One-Part Nonsag: Type S, Grade NS, Class 25, Use NT.
  7. One-Part Pourable: Type S, Grade P, Class 25, Use T.
  8. Water Immersible: One- or two-part, Grade NS, Class 25, Use NT, specifically recommended by the manufacturer for sealing joints immersed continuously in water.

## 2.03 PAVING JOINT SEALANTS

- A. Urethane Paving Sealants:
1. Two-Part: Pourable, chemically curing (cold-applied) complying with FS SS-S-200:
    - a. Urethane, with minimum movement capability of plus or minus 12-1/2 percent.
    - b. Bitumen modified polymer; also complying with ASTM C 920, Type M, Grade P, Class 25, Use T.
  2. One-Part: Pourable, chemically curing (cold-applied), bitumen modified urethane, complying with

FS SS-S-200.

- B. PVC/Coal-Tar Paving Sealants (ASTM D 3406): Hot-poued, one-part, polyvinyl chloride/coal tar blend; complying with ASTM D 3406.
- C. Rubber/Asphalt Paving Sealant (ASTM D 3405): Hot-poured, one-part rubber/asphalt blend; complying with ASTM D 3405.

#### 2.04 SOLVENT-RELEASE-CURING SEALANTS

- A. Acrylic Sealant: Nonsag, one-part, solvent-release-curing; complying with ASTM C 920, Type S, Grade NS, Use NT, with the following exceptions:
  - 1. Weight loss: Fifteen (15) percent, maximum.
  - 2. Movement capability: 12-1/2 percent in both extension and compression, minimum.
- B. Butyl Sealant: Nonsag, one part. solvent-release-curing; complying with FS A-A-272, Type III; nonstaining; paintable.
- C. Small Joint Sealant: Solvent-release-curing, synthetic rubber; intended for joints up to 3/16 inch wide.

#### 2.05 NONCURING SEALERS

- A. Butyl Polyisobutylene Sealant: Noncuring, nondrying, solvent-release; complying with 809.2, as described in AAMA 800.

#### 2.06 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backers - General: Nonstaining; recommended or approved by sealant manufacturer for specific use.
  - 1. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.
- E. Masking materials: Approved by sealant manufacturer; nonabsorbent, nonstaining.

### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- A. Verify that substrate surfaces and joint openings are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

### 3.02 PREPARATION

- A. Just before starting sealer installation, clean out joints in accordance with sealer manufacturer's recommendations and as follows:
  - 1. Remove loose materials and foreign matter which might impair adhesion of sealant.
  - 2. Dry out damp and wet substrates thoroughly.
  - 3. Clean M-type and O-type substrates by suitable mechanical or chemical methods in accordance with manufacturer's instructions.
  - 4. Clean A-type and G-type substrates by chemical or other methods which will not damage the substrate.
  - 5. Use cleaning methods which will not leave residues that will impair adhesion.
  - 6. Concrete: Remove laitance and form-release coatings.
- B. Priming: Prime substrates as recommended by the sealer manufacturer.
- C. Masking: Mask surfaces adjacent to joints which would be damaged by primers and sealers or by cleanup. Remove masking as soon as practical.
- D. Install fillers where needed to provide proper joint depth or support for sealant backers.

### 3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation of gunnable and pourable sealants in accordance with ASTM C 1193.
- C. Perform acoustical sealant application work in accordance with ASTM C 919.
- D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.
- E. Install bond breaker where joint backing is not used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- H. Tool joints as specified by manufacturer of each sealant type. Completely fill the joint; making full contact with bond surfaces; tool nonsag sealants to smooth surface eliminating air pockets.
  - 1. Use concave joint shape as shown on Figure 5A in ASTM C 1193, where not otherwise indicated.
  - 2. Use flush joint shape indicated in Figure 5B in ASTM C 1193, where indicated.

### 3.04 CLEANING

- A. Clean adjacent soiled surfaces.

### 3.05 PROTECTION OF FINISHED WORK

- A. Protect sealants until cured.
- B. Remove and replace damaged sealers.

3.06 SCHEDULE OF JOINT SEALERS

- A. General: Unless otherwise indicated, joints around perimeter of frames, where indicated to be sealed, are to be sealed using sealer specified for the substrate adjacent to the frame.
- B. Exterior:
1. Exterior Joints for Which No Other Sealer Is Indicated:
    - a. Use one of the following sealants:
      - 1) Silicone sealant.
      - 2) Urethane sealant.
      - 3) Acrylic sealant.
    - b. Backer: Backer rod.
    - c. Joint shape: Concave joint configuration.
  2. Exterior Joints Well Protected from Weather and Not Subject to Movement
    - a. Use one of the following sealants:
      - 1) Acrylic sealant.
      - 2) Butyl sealant.
    - b. Backer: Backer rod.
    - c. Joint shape: Concave joint configuration.
  3. Exterior Joints at Penetrations of Exterior Walls and Roofs Around Pipes, Ducts, and Conduit
    - a. Use one of the following sealants:
      - 1) Same as used for adjacent substrates.
    - b. Backer: Backer rod as necessary.
    - c. Joint shape: Concave joint configuration.
  4. Vehicular Paving Joints, Not Over 1-1/2 Percent Slope
    - a. Use one of the following sealants:
      - 1) Silicone for use T.
      - 2) Urethane paving sealant
      - 3) PVC/coal tar paving sealant (ASTM D 3406).
      - 4) Rubber-asphalt paving sealant (ASTM D 3405).
    - b. Backer: Joint filler as specified elsewhere.
    - c. Joint shape: Flush
  5. Below-Grade Joints
    - a. Use one of the following sealants:
      - 1) Polysulfide sealant for water immersion.
      - 2) Urethane sealant for water immersion.
    - b. Backer: Backer rod.
    - c. Joint shape: Concave joint configuration.
- C. Interior:
1. Interior Joints For Which No Other Sealer Is Indicated
    - a. Use one of the following sealants:
      - 1) Silicone sealant.
      - 2) Polysulfide sealant
      - 3) Urethane sealant.
    - b. Backer: Backer rod.
    - c. Joint shape: Concave joint configuration.
  2. Interior Floor Joints and Pedestrian Paving Joints, Less than 1-1/2 Percent Slope
    - a. Use one of the following sealants:
      - rd1) Polysulfide sealant.
      - 2) Silicone sealant for use T..
      - 3) Urethane sealant for use T.
    - b. Backer: Backer rod.
    - c. Joint shape: Flush joint configuration.
  3. Interior Acoustical Joints.
    - a. Use one of the following sealants:
      - 1) Butyl.
      - 2) Acrylic.

- b. Backer: Backer rod.
- c. Joint shape: Concave joint configuration.
- 4. Interior Joints in Wet Areas
  - a. Use one of the following sealants:
    - 1) Mildew resistant silicone sealant.
  - b. Backer: Backer rod.
  - c. Joint shape: Concave joint configuration.

**END OF SECTION**

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## SECTION 08 110 - STEEL DOORS AND FRAMES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Steel doors and frames.
- B. Assemblies for fire-rated openings.
- C. Insulated doors.

#### 1.02 RELATED SECTIONS

- A. Section 04810 - Grouting frames in masonry.
- B. Section 08211 - Flush Wood Doors.
- C. Section 08710 - Door Hardware.
- D. Section 08800 - Glazing: Glass for lights.

#### 1.03 REFERENCES

- A. ASTM A 366/A 366M - Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality; 1996.
- B. ASTM A 569/A 569M - Standard Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality; 1996.
- C. ASTM A 591/A 591M - Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Mass Applications; 1989 (Reapproved 1994).
- D. NFPA 80 - Standard for Fire Doors and Windows; National Fire Protection Association; 1995.
- E. SDI 100 - Recommended Specifications Standard Steel Doors and Frames; Steel Door Institute; 1991 (ANSI/SDI-100).
- F. SDI 105 - Recommended Erection Instructions for Steel frames; Steel Door Institute; 1992.
- G. SDI 111 - Recommended Standard Details for Steel Doors & Frames; Steel Door Institute; current edition.
- H. SDI 113 - Test Procedure and Acceptance Criteria for Apparent Thermal Performance of Steel Door and Frame Assemblies; Steel Door Institute; 1979.
- I. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard details and catalog data demonstrating compliance with referenced standards; installation instructions.
- C. Certificates:
  - 1. Provide manufacturer's certification that products comply with referenced standards.
  - 2. Provide evidence of manufacturer's membership in the Steel Door Institute.

- D. Door, frame, and hardware schedule in accordance with SDI 111.

#### 1.05 QUALITY ASSURANCE

- A. Quality Standard: Comply with SDI 100.
- B. Manufacturer Qualifications: Provide all products from a single manufacturer who is a member of the Steel Door Institute.
- C. Labeled Assemblies: At all locations where fire-rated door and frame assemblies are required, provide assemblies which comply with NFPA 80 and have been tested and labeled in accordance with ASTM E 152 by agency acceptable to governing authorities.
- D. Coordination: Transmit copy of final shop drawings to wood door manufacturer to allow prefitting of wood doors to steel frames.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect products from moisture, construction traffic, and damage.
- B. Store vertically under cover. Do not use non-vented plastic or canvas shelters. Should wrappers become wet, remove immediately.
- C. Place units on 4 inch high wood sills or in a manner that will prevent rust or damage. Provide 1/4 inch space between doors to promote air circulation.

### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS

- A. Manufacturers: Products of the following manufacturers, provided they comply with the requirements of the contract documents, will be among those considered acceptable:
  - 1. Allied Steel Products, Inc.
  - 2. Ceco Door Products, a Division of United Dominion.
  - 3. Curries Company/Essex Industries, Inc.
  - 4. Republic Builders Products Division/DESCO
  - 5. Steelcraft Manufacturing Company/Masco Industries.

#### 2.02 MATERIALS

- A. Steel Sheet for Doors and Frames:
  - 1. Cold rolled steel: ASTM A 366/A 366M and ASTM A 568, commercial quality, matte finish exposed, oiled.
  - 2. Hot rolled steel: ASTM A 569/A 569M and ASTM A 568, commercial quality, pickled and oiled.
  - 3. Galvanized steel: ASTM A 653/A 653M; hot-dipped zinc-coated steel; hot-dipped zinc-iron alloy-coated steel of A40/ZF120 coating, minimum.
- B. Fasteners and Inserts: Units standard with manufacturer.
  - 1. Exterior walls: ASTM A 153, hot-dip galvanized, Class C or D.
- C. Steel Sheet for Anchors and Accessories: Electrolytically deposited zinc coated steel; ASTM A 591/A 591M, coating Class B, minimum.
- D. Paint:
  - 1. Primer: Manufacturer's standard rust-inhibitive coating, suitable to receive finish coatings specified.

#### 2.03 FABRICATION

- A. General: Shop-fabricate assemblies to greatest extent possible, assuring that installed units will be without warp, twist, bow, or other defect in appearance or function.
- B. Exposed Door Faces: Fabricate from cold-rolled steel.
- C. Frames: Fabricate from cold-rolled or hot-rolled steel.
- D. Edge Channels, Stiffeners, and Reinforcement: Fabricate from cold-rolled or hot-rolled steel.
- E. Exposed Screws and Bolts: Where required, provide only countersunk, flat Phillips-head fasteners.
- F. Insulated Assemblies: At locations scheduled, provide insulating door and frame assemblies which have been tested in accordance with ASTM C 236 for thermal resistance.
  - 1. U-value: 0.24 BTU per hour per square foot per degree F, minimum.
- G. Hardware Preparation: Comply with DHI A115 series specifications for door and frame preparation, using final hardware schedule and templates from hardware supplier.
  - 1. Reinforcement: Reinforce doors and frames for field-installed exposed hardware items.
  - 2. Locations: Comply with final shop drawings.
- H. Shop Painting:
  - 1. Preparation: Clean surfaces thoroughly before beginning painting operations, removing rust, scale, oil, grease, and other contaminants.
  - 2. Primer: Apply primer evenly to achieve full protection of all exposed surfaces.

#### 2.04 DOORS AND FRAMES

- A. Comply with ANSI A250.8.
- B. Fire-Rated Openings: Comply with NFPA 80; UL or ITS (Warnock Hersey) listed.
  - 1. Affix permanent labels attesting to fire resistance.
  - 2. At stairway enclosures, provide units listed for 450 degree F maximum temperature rise rating for 30 minutes of exposure.
- C. Exterior Doors:
  - 1. Grade II - Heavy-Duty, Model 1 - As indicated on the drawings.
  - 2. Thickness: 1-3/4 inches.
  - 3. Provide insulated construction with U-value of at least 0.48 when tested in accordance with SDI 113.
  - 4. Provide manufacturer's standard foam insulated core.
  - 5. Steel stiffened grid core and stile and rail units are exempt from thermal rating requirements.
- D. Steel Frames:
  - 1. General: Fabricate steel frames for scheduled openings, in styles and profiles shown, using concealed fasteners.
    - a. Minimum gage: As indicated in SDI 100 for door grades and models required for project.
    - b. Construction: Either knock-down field assembled or mitered and welded corners.
  - 2. Door Silencers: Drill stops to receive silencers, except on frames scheduled for weatherstripping.
    - a. Provide for 3 silencers on strike jambs of single-swing frames.
    - b. Provide for 2 silencers on heads of frames for pairs of doors.
  - 3. Guards: Weld protective covers to back of hardware openings at locations where grout, plaster, or other materials might interfere with hardware operation.
  - 4. Wide Openings: Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, or provide frames of minimum 14 gage steel.
- E. Galvanizing: Provide units of galvanized steel at exterior openings.
- F. Glazed Lights: Provide glazing stops and beads.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that project conditions are suitable before beginning installation of frames.
  - 1. For wrap-around frames, verify that completed openings are of correct size and thickness.
  - 2. For butt type frames, verify that completed openings are of correct size.
- B. Correct unsatisfactory condition before proceeding with installation.

#### **3.02 INSTALLATION**

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- A. Install frames plumb, level, rigid, and in true alignment as recommended in SDI 105 and A115.1G.
  - 1. Anchors: Provide 3 wall anchors per jamb at hinge and strike levels and minimum 18 gage base anchors.
  - 2. Provide base anchors which are adjustable in height.
  - 3. Openings at in-place masonry: Fasten frames securely to masonry with machine screws and masonry anchorages.
  - 4. Fire-rated openings: Comply with requirements of NFPA 80.
- B. Install doors plumb and in true alignment and fasten to achieve the maximum operational effectiveness and appearance of the unit. Maintain clearances specified in SDI 100 and NFPA 80 whichever is more restrictive.
- C. If additives are used in masonry or plaster work during cold weather, field coat the inside of steel frames with a bituminous compound to prevent corrosion.

#### **3.03 ADJUST AND CLEAN**

- A. Touch-up: At locations where primer has been abraded or minor rusting has occurred, sand smooth and spray-apply compatible primer.
- B. Adjust doors for proper operation, free from binding or other defects.
- C. Clean and restore soiled surfaces. Remove scraps and debris, and leave site and a clean condition.

**END OF SECTION**

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## SECTION 08 211 - WOOD DOORS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Flush wood doors; flush configuration; fire rated and non-rated.
- B. Stile and Rail Wood Doors.

#### 1.02 RELATED SECTIONS

- A. Section 08112 - Steel Doors and Frames.
- B. Section 08710 - Door Hardware.
- C. Section 08800 - Glazing.

#### 1.03 REFERENCES

- A. AWI P-200 - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute; 1997, Seventh Edition, Version 1.0.
- B. NFPA 80 - Standard for Fire Doors and Windows; National Fire Protection Association; 1995.
- C. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association; 1995.
- D. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing.
- D. Samples: Submit two samples of door veneer, 6x6 inch in size illustrating wood grain, stain color, and sheen.
- E. Manufacturer's Installation Instructions: Indicate special installation instructions.

#### 1.05 QUALITY ASSURANCE

- A. Perform work in accordance with AWI P-200, Section 1300, Custom Grade.
- B. Finish doors in accordance with AWI P-200, Section 1500, grades identified in schedule.
- C. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

#### 1.06 REGULATORY REQUIREMENTS

- A. Fire Door Construction: Conform to NFPA 252.

1. Listed and classified by UL as suitable to for the purpose specified and indicated.
  - B. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as indicated.
- 1.07 DELIVERY, STORAGE, AND PROTECTION
- A. Package, deliver and store doors in accordance with AWI P-200, Section 1300.
  - B. Accept doors on site in manufacturer's packaging. Inspect for damage.
  - C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.
- 1.08 PROJECT CONDITIONS
- A. Coordinate the work with door opening construction, door frame and door hardware installation.
- 1.09 WARRANTY
- A. See Section 01780 - Closeout Submittals for additional warranty requirements.
  - B. Provide warranty for the following term:
    1. Exterior Doors: Five (5) years.
    2. Interior Doors: Two (2) years.
  - C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Flush Panel Doors:
  1. Eggers Industries.
  2. Southwood Door Company.
  3. Weyerhaeuser Architectural Doors.
  4. Substitutions: See Section 01600 - Product Requirements.

### **2.02 DOOR TYPES**

- A. Flush Panel:
  1. Interior Doors: 1-3/4 inches thick; solid core construction.
  2. Interior Doors - Veneer: Custom grade wood veneer, Birch species, plain sliced, with balance matched grain, for transparent finish.

### **2.03 FLUSH DOOR CORES**

- A. Non-Rated Solid Core and 20 Minute Rated Doors: AWI P-200, Section 1300, Type PC - Particleboard.
- B. Fire Rated Doors: AWI P-200, Section 1300, Type FD, hourly ratings as indicated.

### **2.04 FABRICATION**

- A. Fabricate doors in accordance with AWI Quality Standards requirements.
- B. Fabricate fire rated doors in accordance with UL requirements. Attach fire rating label to door.

- C. Provide solid blocks at lock edge for hardware reinforcement.
  - 1. Provide solid blocking for other throughbolted hardware.
- D. Vertical Exposed Edge of Stiles - Veneer Faces: Of same species as veneer facing.
- E. Fit door edge trim to edge of stiles after applying veneer facing.
- F. Bond edge banding to cores.
- G. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.
- H. Provide edge clearances in accordance with AWI 1600.

#### 2.05 FINISH

- A. Interior Doors:
  - 1. Factory finish doors in accordance with AWI P-200, Section 1500 to the following finish designations:
    - a. Transparent Finish: TR-4, transparent conversion varnish, Premium quality, matte sheen.
  - 2. Seal door top edge with color sealer to match door facing.
- B. Exterior Doors:
  - 1. Factory finish doors in accordance with AWI P-200, Section 1500 to the following finish designations:
    - a. Transparent Finish: TR-4, transparent conversion varnish, Premium quality, matte sheen.

### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

#### 3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and AWI P-200 requirements.
  - 1. Install fire-rated doors in accordance with NFPA 80 requirements.
- B. Trim non-rated door width by cutting equally on both jamb edges.
- C. Trim door height by cutting bottom edges to a maximum of 3/4 inch (19 mm).
  - 1. Trim fire door height at bottom edge only, in accordance with fire rating requirements.
- D. Machine cut for hardware.
- E. Coordinate installation of doors with installation of frames specified in Section 08112 and hardware specified in Section 08710.
- F. Coordinate installation of glass and glazing.

#### 3.03 INSTALLATION TOLERANCES

- A. Conform to AWI P-200 requirements for fit and clearance tolerances.

- B. Conform to AWI P-200, Section 1300 for maximum diagonal distortion.

**3.04 ADJUSTING**

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

**END OF SECTION**

## SECTION 08 331 - OVERHEAD COILING DOORS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Overhead coiling doors and shutters, operating hardware, fire-rated, non-fire-rated, and exterior, manual and electric operation.
- B. Wiring from electric circuit disconnect to operator to control station.

#### 1.02 REFERENCES

- A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2000.
- B. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 1997.
- D. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC; National Electrical Manufacturers Association; 1993.
- E. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 1998.
- F. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association; 1999.
- G. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

#### 1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general construction, component connections and details, electrical equipment.
- C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
- D. Manufacturer's Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.
- E. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

### PART 2 PRODUCTS

#### 2.01 COILING DOORS

- A. Exterior Coiling Doors: Steel slat curtain.
  - 1. Capable of withstanding positive and negative wind loads of 20 psf, without undue deflection or damage to components.
  - 2. Sandwich slat construction with insulated core of plastic foam type insulation; insulation value: R of .5.
  - 3. Nominal Slat Size: 2 inches wide x required length.
  - 4. Finish: Galvanized.

5. Finish: Factory painted, color as selected.
  6. Guides: Angles; galvanized steel.
  7. Hood Enclosure: Manufacturer's standard; primed steel.
  8. Electric operation.
  9. Mounting: Within framed opening.
  10. Exterior lock and latch handle.
- B. Non-Fire-Rated Interior Coiling Counter Shutter: Steel slat curtain.
1. Single thickness slats.
  2. Nominal Slat Size: 2 inches wide x required length.
  3. Finish: Factory painted, color as selected.
  4. Guides: Angles; primed steel.
  5. Hood Enclosure: Manufacturer's standard; primed steel.
  6. Manual hand chain lift operation.
- C. Acoustical Fire-Rated Coiling Door: Steel slat curtain; conform to NFPA 80.
1. Product: McKeon Door Company, Model FSFD-STC, Acoustically Rated Fire Doors
    - a. 1-1/2 hour fire rating.
    - b. Provide products listed and labeled by UL or ITS (Warnock Hersey) as suitable for the purpose specified and indicated.
    - c. Oversized Openings: Provide certificate of compliance from authority having jurisdiction indicating approval of fire rated units and operating hardware assembly.
    - d. Single thickness slats.
    - e. Nominal Slat Size: 2 inches wide x required length.
    - f. Finish: Manufacturer's standard powder coating polyester finish in color to be selected.
    - g. Guides: Angles; primed steel.
      - 1) Provide acoustical seals between guides and slats.
    - h. Hood Enclosure: Manufacturer's standard; primed steel.
    - i. Release Mechanism: Fire alarm system activated with automatically governed closing speed.
    - j. Electric operation.

## 2.02 MATERIALS

- A. Curtain Construction: Interlocking slats.
1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
  2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
  3. Weatherstripping: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
- B. Steel Slats: Minimum 18 gage ASTM A 653/A 653M galvanized steel sheet.
1. Galvanizing: Minimum G90/Z275 coating.
- C. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.
- D. Steel Guides: Formed from galvanized steel sheet, 16 gage; 2 inch wide; complying with ASTM A 653/A 653M.
1. Galvanizing: Minimum G90/Z275 coating.
  2. Prime paint.
- E. Hood Enclosure: Internally reinforced to maintain rigidity and shape.
- F. Hardware:
1. Lock Cylinders: Specified in Section 08710.
  2. Latch Handle: Interior and exterior handle.

- G. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

### 2.03 ELECTRIC OPERATION

- A. Electric Operators:
  - 1. Mounting: Side mounted.
  - 2. Motor Enclosure:
    - a. Exterior doors: NEMA MG 1 Type 4; open drip proof.
  - 3. Motor Rating: 1/3 hp; continuous duty.
  - 4. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
  - 5. Controller Enclosure: NEMA 250 Type 1.
  - 6. Opening Speed: 12 inches per second.
  - 7. Brake: Adjustable friction clutch type, activated by motor controller.
  - 8. Manual override in case of power failure.
- B. Control Station: Standard three button (OPEN-STOP-CLOSE) momentary control for each operator.
  - 1. 24 volt circuit.
- C. Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to stop operator upon striking object, hollow neoprene covered.

## **PART 3 EXECUTION**

### 3.01 EXAMINATION

- A. Verify that opening sizes, tolerances and conditions are acceptable.

### 3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. In addition, install fire-rated doors in accordance with NFPA 80.
- C. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- D. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- E. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- F. Coordinate installation of electrical service with Section 16155.
- G. Complete wiring from disconnect to unit components.
- H. Complete wiring from fire alarm system .

### 3.03 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.

### 3.04 CLEANING

- A. Clean installed components.

- B. Remove labels and visible markings.

**END OF SECTION**

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## SECTION 08 412 - ALUMINUM STOREFRONT

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Perimeter sealant.

#### 1.02 RELATED SECTIONS

- A. Section 07900 - Joint Sealers: Perimeter sealant and back-up materials.
- B. Section 08800 - Glazing.

#### 1.03 REFERENCES

- A. AA DAF-45 - Designation System for Aluminum Finishes; The Aluminum Association, Inc.; 1997, Eighth Edition.
- B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 1997.
- C. AAMA 501.2 - Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage; American Architectural Manufacturers Association; 1994 (part of AAMA 501).
- D. AAMA 606.1 - Voluntary Guide Specifications and Inspection Methods for Integral Color Anodic Finishes for Architectural Aluminum; American Architectural Manufacturers Association; 1976.
- E. AAMA 607.1 - Voluntary Guide Specification and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum; American Architectural Manufacturers Association; 1977.
- F. AAMA 1503.1 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; American Architectural Manufacturers Association; 1988.
- G. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers; 1995 (ANSI/ASCE 7-95).
- H. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 1996.
- I. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 1995.
- J. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 1996.
- K. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 1996.
- L. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 1991.
- M. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference; 1996.
- N. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and

Doors by Uniform Static Air Pressure Difference; 1996.

#### 1.04 PERFORMANCE REQUIREMENTS

- A. Design and size components to withstand the following load requirements, as measured in accordance with ASTM E 330:
  - 1. Wind loads: Comply with requirements of ASCE 7.
  - 2. Member deflection: Limit member deflection under all live and dead loads to flexure limit of glass or L/175, whichever is smaller, and in any direction, with full recovery of glazing materials.
    - a. Deflection in plane of wall: Not greater than that which would reduce glass edge clearance to 25 percent of design dimension or 1/8 inch, whichever is greater, or that which would reduce glass bite to 75 percent of design dimension.
    - b. Design system to withstand 150 percent of design wind load with no failure or permanent deformation greater than 0.2 percent of span.
- B. Movement: Accommodate movement between storefront and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
- C. Air Infiltration: Limit air infiltration through assembly to 0.06 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 6.24 psf as measured in accordance with ASTM E 283.
- D. Water Leakage: None, when measured in accordance with ASTM E 331 with a test pressure difference of 6.24 lbf/sq ft.
- E. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
- F. Thermal Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 120 degrees F over a 24 hour period without causing detrimental effect to system components, anchorages, and other building elements.

#### 1.05 SUBMITTALS

- A. See Section 01305 - Submittals, for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, vent hardware and internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.
- D. Samples: Submit two samples 2x6 inches in size illustrating finished aluminum surface, glass, glazing materials.
- E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner 's name and registered with manufacturer.

#### 1.06 QUALITY ASSURANCE

- A. Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems with minimum three years of documented experience.

#### 1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Handle products of this section in accordance with AAMA CW-10.

- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond to aluminum when exposed to sunlight or weather.

1.08 PROJECT CONDITIONS

- A. Coordinate the work with installation of firestopping components or materials.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.10 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS

- A. Kawneer Company, Inc.; Product 1600 Wall System and EnCore, thermally broken, exterior storefront system.
- B. Other Acceptable Manufacturers:
  - 1. YKK AP America, Inc.
  - 2. United States Aluminum Corp.
  - 3. Vistawall Architectural Products.
  - 4. Arch Amarlite.
  - 5. Substitutions: See Section 01600 - Product Requirements.

2.02 COMPONENTS

- A. Aluminum-Framed Storefront: Factory fabricated, aluminum framing members with infill, and related flashings, anchorage and attachment devices.
  - 1. Color: As selected by the Architect from the manufacturer's standard colors.
- B. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
- C. Infill Panels: Insulated, aluminum sheet face and back, with edges formed to fit glazing channel and sealed.
- D. Entrances: Glazed aluminum: Factory fabricated, aluminum framing members with tempered glass and glazing stops.
  - 1. Doors:
    - a. Thickness: 2 inches.
    - b. Top Rail: 3-3/8 inches wide.
    - c. Vertical Stiles: 3-1/2 inches wide.
    - d. Bottom Rail: 6-3/4 inches wide.
    - e. Glazing Stops: Square.

- f. Intermediate Mullions: As indicated on the drawings in manufacturer's standard extrusions.
- g. Finish: Same as storefront.

### 2.03 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T-5 temper.
- B. Sheet Aluminum: ASTM B209 (ASTM B209M).
- C. Fasteners: Stainless steel.
- D. Exposed Flashings: 0.032 inch thick aluminum sheet; finish to match framing members.
- E. Perimeter Sealant: Silicone sealant as specified in Section 07900 Joint Sealers.
- F. Glass in Storefront System: As specified in Section 08800.
- G. Glass in Doors: Clear tempered in door manufacturer's standard thickness.
- H. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- x936l. Glazing Accessories: As specified in Section 08800.

### 2.04 FINISHES

- A. Class I Natural Anodized Finish: AAMA 607.1 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.
- B. Touch-Up Materials: As recommended by coating manufacturer for field application.

### 2.05 HARDWARE

- A. Door Hardware: By door manufacturer as listed below. Balance of door hardware by supplier as listed in Section 08710 Door Hardware.
  - 1. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
  - 2. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.
- B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- C. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

### 2.06 FABRICATION

- A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Prepare components to receive anchor devices. Fabricate anchors.
- D. Coat concealed metal surfaces that will be in contact with cementitious materials, masonry, treated wood or dissimilar metals with bituminous paint or as recommended by the storefront manufacturer..
- E. Arrange fasteners and attachments to conceal from view.
- F. Reinforce components internally for door hardware.
- G. Reinforce framing members for imposed loads.

- H. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.
  - 1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

#### **3.02 INSTALLATION**

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Install operating sash.
- J. Set thresholds in bed of mastic and secure.
- K. Install glass and infill panels in accordance with Section 08800, using glazing method required to achieve performance criteria.
- L. Install perimeter sealant in accordance with Section 07900.

#### **3.03 ERECTION TOLERANCES**

- A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

#### **3.04 CLEANING AND PROTECTION**

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by method acceptable to sealant manufacturer.

- D. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.
- E. Protect finished work from damage.

**END OF SECTION**

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## SECTION 08 710 - DOOR HARDWARE

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Hardware for wood and hollow metal doors.
- B. Hardware for fire-rated doors.
- C. Thresholds.
- D. Weatherstripping, seals and door gaskets.

#### 1.02 RELATED SECTIONS

- A. Section 08112 - Steel Doors and Frames.
- B. Section 08212 - Wood Doors.

#### 1.03 ALLOWANCES

- A. See Section 01210 - Allowances, for allowances affecting this section.

#### 1.04 REFERENCES

- A. ANSI/CABO A117.1 - American National Standard for Buildings and Facilities - Providing Accessible and Usable Buildings and Facilities; Council of American Building Officials; 1992.
- B. BHMA A156.1 - American National Standard for Butts and Hinges; Builders Hardware Manufacturers Association; 1997 (ANSI/BHMA A156.1).
- C. BHMA A156.2 - American National Standard for Bored and Preamsembled Locks & Latches; Builders Hardware Manufacturers Association; 1996 (ANSI/BHMA A156.2).
- D. BHMA A156.18 - American National Standard for Materials and Finishes; Builders Hardware Manufacturers Association; 1993 (ANSI/BHMA A156.18).
- E. BHMA A156.21 - American National Standard for Thresholds; Builders Hardware Manufacturers Association; 1996 (ANSI/BHMA A156.21).
- F. DHI A115 Series - American National Standard Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; current edition.
- G. DHI A115W Series - American National Standard Specifications for Wood Doors and Frame Preparation for Hardware; Door and Hardware Institute; 1994 (R1995).
- H. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute; 1990.
- I. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Wood Flush Doors; Door and Hardware Institute; 1993.
- J. NFPA 80 - Standard for Fire Doors and Windows; 1995.
- K. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; 1997.

- L. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 1995.
- M. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

**1.05 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Hardware Schedule
  - 1. Indicate locations and mounting heights of each type of hardware, schedules, catalog cuts,.
  - 2. Submit manufacturer's parts lists and templates.
- C. Keying Schedule: Separate schedule showing how each lock is keyed.
- D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- F. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner 's name and registered with manufacturer.

**1.06 QUALITY ASSURANCE**

- A. Perform work in accordance with the following requirements:
  - 1. NFPA 101.
  - 2. NFPA 80.
  - 3. NFPA 252.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- C. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with 5 years of experience and who employs an Architectural Hardware Consultant (AHC).
  - 1. Qualifications of Architectural Hardware Consultant (AHC): Certified by the Door and Hardware Institute.
- D. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.

**1.07 REGULATORY REQUIREMENTS**

- A. Conform to applicable code for requirements applicable to fire rated doors and frames.
- B. All Hardware on Fire-Rated Doors: Listed and classified by UL as suitable for the purpose specified and indicated.
- C. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

1.08 DELIVERY, STORAGE, AND PROTECTION

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

1.09 COORDINATION

- A. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.
- B. Furnish templates for door and frame preparation.
- C. Coordinate Owner 's keying requirements during the course of the Work.

1.10 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year warranty for door closers and locksets.

1.11 MAINTENANCE PRODUCTS

- A. Provide special wrenches and tools applicable to each different or special hardware component.
- B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

**PART 2 PRODUCTS**

2.01 MATERIALS - GENERAL

- A. Manufacturers:
  - 1. Obtain all items of each type from the same manufacturer.
  - 2. Where a particular manufacturer's product is specified, products of other manufacturers will be considered for substitution.
- B. Manufacturer's Names and Trade Names: Display of names, logos, or other identification is acceptable on lock or hinge edge of door, but not where visible on either face of door.
  - 1. Exception: Required fire labels.
  - 2. Exception: As directed by or acceptable to the Architect.
  - 3. Exception: Manufacturer's name or other identification on rim of lock cylinders.
- C. Fasteners: Provide hardware prepared by the manufacturer with fastener holes for machine screws, unless otherwise indicated.
  - 1. Provide all fasteners required for secure installation.
  - 2. Select fasteners appropriate to substrate and material being fastened.
  - 3. Use flathead Phillips screws unless otherwise indicated.
  - 4. Use fasteners impervious to corrosion outdoors and on exterior doors.
  - 5. Exposed screws: Match hardware finish.
  - 6. Where it is not possible to reinforce substrate adequately for screws, use through-bolts with sleeves or use sex bolts.
    - a. Do not use where head or nut would be exposed on face of door, unless specifically indicated or made necessary by other requirements.
    - b. Finish exposed heads and nuts the same as hardware on that side of the door.
- D. Finish on All Exposed Metal Items: Satin chrome plated US26D (626) or satin stainless steel US32D.
  - 1. Exceptions:
    - a. Hinges: Where steel hinges are acceptable, use matching plated finish.

- b. As indicated for specific items.
- 2. Items specified with the same finish shall match as closely as possible using standard manufactured products.
- 3. Provide finishes matching BHMA A156.18 designations.

**2.02 ACCEPTABLE MANUFACTURERS**

- A. Hinges: Hager
- B. Latch Sets: Schlage.
- C. Push/Pulls: Rockwood.
- D. Locksets: Schalge.
- E. Exit Devices: Von Duprin.
- F. Closers: LCN.
- G. Overhead Holders: Glynn Johnson.
- H. Manual and Automatic Flush Bolts: Rockwood.
- I. "Dutch Door" Bolt: Quality
- J. Gasketing: National Guard Products.
- K. Thresholds: National Guard Products.
- L. Wall/Floor Stops: Rockwood
- 936M. Silencers: Quality
- N. Weatherstripping: National Guard Products.
- O. Door Robe Hooks: Rockwood
- P. Substitutions: See Section 01600 - Product Requirements.

**2.03 KEYING**

- A. Door Locks: Keyed at the direction of the Owner.
  - 1. Key to existing keying system.
- B. Supply keys in the following quantities:
  - 1. 2 change keys for each lock.

**2.04 FINISHES**

- A. Finishes: Identified in schedule at end of section.

**PART 3 EXECUTION**

3.01 EXAMINATION

- A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions.
- B. Use templates provided by hardware item manufacturer.
- C. Mounting heights for hardware from finished floor to center line of hardware item: As listed in Schedule, unless otherwise noted:
  - 1. For steel doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."
  - 2. For wood doors: Comply with DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."

3.03 ADJUSTING

- A. Adjust work under provisions of Section 01700.
- B. Adjust hardware for smooth operation.

3.04 SCHEDULE - ATTACHED.

**END OF SECTION**

**Heading Number 1**

Pair Doors	Exterior Doors	(Exit)
Pr. 3'-0"x7'-0"x1-3/4"	ALGLxALF	NR

Doors No. 001\*, 004 (Interior Door), 005, 006, 009\*

Each pair of doors to have:

2	Cont. Hinges	SL24HD
2	Cylinders	US32D
2	Exit devices	3547x110NLx338xUS32D
2	Pulls	118-18"CtoC
2	Closers	2030
1	Threshold	950x72"xUS28
2	Floor stop	441xUS32D

\*Security door switch  
Balance of hardware by aluminum door manufacturer

**Heading Number 2**

Pair Doors	Exterior Doors	(Push/Pull)
Pr. 3'-0"x7'-0"x1-3/4"	ALGLxALF	NR

Doors No. 002\*, 003 (Interior Door)

Each pair of doors to have:

2	Cont. Hinges	SL24HD
2	Cylinders	US32D
2	Exit devices	3547x110NLx338xUS32D
2	Pulls	118-18"CtoC
1	Closers	2030
1	Door Operator	2610xUS28
1	Control Box	7982
	Pneumatic Tubing	
3 (Total)	Door Actuator	7910-956
1	Threshold	950x72"xUS28
2	Floor stop	441xUS32D

\*Security door switch  
Balance of hardware by aluminum door manufacturer

**Heading Number 3**

Pair Doors	Interior Doors	(Push/Pull)
Pr. 3'-0"x7'-0"x1-3/4"	ALGLxALF	NR

Doors No. 007

Each pair of doors to have:

2	Cont. Hinges	SL24HD
2	Cylinders	US32D
2	Push/Pull Set	11247-1 x 32" CtoC
2	Closers	2030
2	Floor stop	441xUS32D
1 Pair	Flush Bolts	Aluminum Door Manufacturer

Balance of hardware by aluminum door manufacturer

**Heading Number 4**

Single Door 3'-0"x7'-0"x1-3/4"	Exterior Door ALGLxAL	(Exit) NR
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Doors No. 008\*, 034\*

Each door to have:

1	Cont. Hinges	SL24HD
1	Cylinder	US32D
1	Pull	118-18"CtoCxUS32D *(Door 034 only)
1	Push	RM350-32"CtoCxUS32D
1	Closer	2030
1	Threshold	950x72"xUS28
1	Floor stop	441xUS32D

\*Security door switch

Balance of hardware by aluminum door manufacturer

**Heading Number 5**

Single Door 3'-0"x7'-0"x1-3/4"	Interior Door SCWDxHMF	(Push/Pull) NR
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Doors No. 010, 011, 013, 014,

Each door to have:

1-1/2	Pair	Hinges	BB1168 4-1/2x4-1/2xUS26D
1		Pull	RM350-32"CtoCxUS32D
1		Push	70-6"x16"xUS32D
1		Closer	4041
1		Kickplate	12"x34"x.050"xUS32D
1		Floor stop	441xUS32D
5		Silencers	1337-A

**Heading Number 6**

Single Door 3'-0"x7'-0"x1-3/4"	Interior SCWDxHMF	(Storage) NR
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Doors No. 012, 016, 019, 028, 041, 042, 067, 068, 069, 072

Each door to have:

1-1/2	Pair	Hinges	BB1279 4-1/2x4-1/2xUS26D
1		Lockset	L9080x03xUS26D
1		Floor stop	441xUS32D
5		Silencers	1337-A

**Heading Number 7**

Pair Doors	Interior Door	(Exit)
Pr. 3'-0"x7'-2"x1-3/4"	SCWDxHMF	NR

Doors No. 015, 021

Each pair of doors to have:

3	Pivots	P1, P2, P3 x US26D
2	Exit devices	9847WDCx110NLxUS26Dx338x304L
2	Closers	3130
2	Pulls	RM350-36"CtoC
1	Perimeter Seal	700Sx1/72"x2/86"xB
2	Door Bottom Seals	225Sx36"xB
2	Floor stop	441xUS32D
10	Silencers	1337-A

**Heading Number 8**

Pair Doors	Interior Doors	(Push/Pull)
Pr. 3'-0"x7'-2"x1-3/4"	SCWDxHMF	NR

Doors No. 017, 022

Each pair of doors to have:

3 Pair	Hinges	BB1168 4-1/2x4-1/2xUS32DxNRP
2	Cylinders	US32D
2	Pulls	RM350-36"CtoC
2	Push	70-6"x16"xUS32D
2	Closers	3130
2	Floor stop	441xUS32D
10	Silencers	1337-A

**Heading Number 9**

Single Door	Interior Door	(Entry)
3'-0"x7'-2"x1-3/4"	SCWDxHMF	NR

Doors No. 018\*, 020\*, 023, 025, 026, 030, 031, 032, 033, 035\*, 038, 043,  
045, 048, 050, 054 (1 Hr. Rated), 057, 073, 074, 075

Each door to have:

1-1/2	Pair	Hinges	BB1279 4-1/2x4-1/2xUS26D
1		Lockset	L9050x03xUS26D
1		Perimeter Seal	700Sx1/36"x2/84"xB *(Doors 018, 020, & 035 Only)
1		Door Bottom Seal	225Sx36"xB *(Doors 018, 020, & 035 Only)
1		Floor stop	441xUS32D
5		Silencers	1337-A

**Heading Number 10**

Overhead Coiling Door      Interior Door      (Deadbolt)  
Size Varies (See Drawings) Steel slatxSteel Frame      NR

Doors No.: 024, 060, 062 (1 Hr. Rated)

Each door to have:

1                      Cylinder                      US32D

**Heading Number 11**

Single Door                      Interior Door                      (Entry)  
3'-0"x7'-2"x1-3/4"                      SCWDxHMF (Dutch Door)      NR

Doors No. 027

Each door to have:

3 Pair                      Hinges                      BB1279 4-1/2x4-1/2xUS26D  
1                      Lockset                      L9050x03xUS26D  
1                      Surface bolt                      1708BxUS26D  
1                      Floor stop                      441xUS32D  
6                      Silencers                      1337-A

**Heading Number 12**

Single Door                      Interior Door                      (Privacy)  
3'-0"x7'-2"x1-3/4"                      SCWDxHMF                      NR

Doors No. 029, 049, 061

Each door to have:

1-1/2 Pair                      Hinges                      BB1279 4-1/2x4-1/2xUS26D  
1                      Lockset                      L9040x03xUS26D  
1                      Closer                      4041  
1                      Floor stop                      441xUS32D  
5                      Silencers                      1337-A

**Heading Number 13**

Single Door                      Interior Door                      (Exit)  
3'-0"x7'-2"x1-3/4"                      SCWDxHMF                      NR

Doors No. 036, 037, 052\* (1 Hr. Rated), 063\* (1 Hr. Rated), 064\*\*

Each door to have:

1-1/2 Pair                      Hinges                      BB1168 4-1/2x4-1/2xUS26DxNRP  
1                      Exit Device                      35x990NLxUS26D  
1                      Exit Device                      35x992Lx03xUS26D-F \*(Doors 052 & 063 Only)  
1                      Exit Device                      35x992Lx03xUS26D \*\* (Door 064 Only)  
1                      Closer                      4041

1	Perimeter Seal	700Sx2/84"x1/36"xB
1	Door Bottom Seal	225Sx36"xB
1	Floor stop	441xUS32D
5	Silencers	1337-A

**Heading Number 14**

Single Door	Interior	(Privacy)
3'-0"x7'-0"x1-3/4"	SCWDxHMF	NR

Doors No. 039, 040, 046, 047

Each door to have:

1-1/2 Pair	Hinges	BB1279 4-1/2x4-1/2xUS26D
1	Latchset	L9040x03xUS26D
1	Floor stop	441xUS32D
5	Silencers	1337-A

**Heading Number 15**

Pair Doors	Interior Doors	(Entry)
Pr. 3'-0"x7'-0"x1-3/4"	SCWDxHMF	NR

Doors No. 044

Each pair of doors to have:

3 Pair	Hinges	BB1168 4-1/2x4-1/2xUS32DxNRP
1	Lockset	L9050x03xUS26D
1	Dbl. Dummy trim	L9176
2	Kick plates	12"x34"x.050"xUS32D
2	Hold opens	410HxUS26D
1 Pair	Flush bolts	FB6WxUS26D
2	Floor stop	441xUS32D
10	Silencers	1337-A

**Heading Number 16**

Pair Doors	Interior Doors	(Storeroom)
Pr. 3'-0"x7'-0"x1-3/4"	SCWDxHMF	NR

Doors No. 051

Each pair of doors to have:

3 Pair	Hinges	BB1168 4-1/2x4-1/2xUS32DxNRP
1	Lockset	L9080x03xUS26D
1	Dbl. Dummy trim	L9176
2	Kick plates	12"x34"x.050"xUS32D
2	Hold opens	410HxUS26D
1 Pair	Flush bolts	557xUS26D
2	Floor stop	441xUS32D
10	Silencers	1337-A

**Heading Number 17**

Pair Doors Interior Doors (Entry)  
Pr. 3'-0"x7'-0"x1-3/4" SCWDxHMFxAstragal 1 Hr./"B" Label

Doors No. 053

Each pair of doors to have:

3 Pair	Hinges	BB1168 4-1/2x4-1/2xUS32DxNRP
1	Lockset	L9050x03xUS26D
1	Dbl. Dummy trim	L9176
2	Closers	4041
2	Kick plates	12"x34"x.050"xUS32D
1 Pair	Automatic flush bolts	FB8xUS26D
1	Coordinator	COR-1xUS26D
2	Floor stop	441xUS32D
10	Silencers	1337-A

**Heading Number 18**

Single Door Exterior Door (Exit)  
3'-0"x7'-2"x1-3/4" HMDxHMF NR

Doors No. 055\*, 066\*, 076\*

Each door to have:

1-1/2 Pair	Hinges	BB1168 4-1/2x4-1/2xUS26DxNRP
1	Exit Device	98Lx03-FxUS26D
1	Closer	4041
1	Weatherstrip	132Nax1/36"x2/86" (Doors 055 & 066 only)
1	Threshold	950x36"xAL
1	Floor stop	441xUS32D (Doors 055 & 066 only)
5	Silencers	1337-A

\*Security door switch

**Heading Number 19**

Pair Doors Interior Doors Entry  
Pr. 3'-0"x7'-0"x1-3/4" HMDxHMFxAstragal 1 Hr./ "B" Label

Doors No. 056, 065

Each pair of doors to have:

3 Pair	Hinges	BB1168 4-1/2x4-1/2xUS32DxNRP
1	Lockset	L9050x03xUS26D
1	Dbl. Dummy trim	L9176
2	Closers	4041

2	Kick plates	12"x34"x.050"xUS32D
1 Pair	Automatic flush bolts	FB8xUS26D
1	Coordinator	COR-1xUS26D
2	Floor stop	441xUS32D
10	Silencers	1337-A

**Heading Number 20**

Single Door	Exterior Door	(Entry)
3'-0"x7'-2"x1-3/4"	HMDxHMF	NR

Doors No. 059\*

Each door to have:

1-1/2 Pair	Hinges	BB1168 4-1/2x4-1/2xUS26DxNRP
1	Lockset	L9050x03xUS26D
1	Closer	4041
1	Kickplate	12"x34"x.050"xUS32D
1	Weatherstrip	132Nax1/36"x2/86"
1	Threshold	950x36"xAL
1	Floor stop	441xUS32D
5	Silencers	1337-A

\*Security door switch

**Heading Number 21**

Single Door	Exterior Door	(Storeroom)
3'-0"x7'-2"x1-3/4"	HMDxHMF	NR

Doors No. 070\*, 071\*

Each door to have:

1-1/2 Pair	Hinges	BB1168 4-1/2x4-1/2xUS26DxNRP
1	Lockset	L9080x03xUS26D
1	Closer	4041
1	Kickplate	12"x34"x.050"xUS32D
1	Weatherstrip	132Nax1/36"x2/86"
1	Threshold	950x36"xAL
1	Floor stop	441xUS32D
5	Silencers	1337-A

\*Security door switch

**End of Hardware Schedule**

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## SECTION 08 800 - GLAZING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Glass.
- B. Glazing compounds and accessories.

#### 1.02 RELATED SECTIONS

- A. Section 08110 - Steel Doors and Frames.
- B. Section 08412 - Aluminum Storefront.

#### 1.03 REFERENCES

- A. ASTM C 864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 1993.
- B. ASTM C 1036 - Standard Specification for Flat Glass; 1991.
- C. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 1991 (Reapproved 1995).
- D. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1996a.
- E. ASTM E 283 - Standard Test Method For Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 1991.
- F. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference; 1996.
- G. ASTM E 773 - Standard Test Methods for Seal Durability of Sealed Insulating Glass Units; 1988 (Reapproved 1993).
- H. ASTM E 774 - Standard Specification for Sealed Insulating Glass Units; 1992.
- I. GANA (GM) - GANA Glazing Manual; Glass Association of North America; 1997.
- J. GANA (SM) - FGMA Sealant Manual; Glass Association of North America; 1990.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
- D. Samples: Submit two samples 6x6 inch in size of glass units.
- E. Certificates: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.

1.06 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide a five (5) year warranty to include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

**PART 2 PRODUCTS**

2.01 FLAT GLASS MATERIALS

- A. Manufacturers:
  - 1. Guardian Industries, Falconer Glass Industries.
  - 2. Libbey-Owens-Ford Co.
  - 3. Visteon, Ford Motor Co., Glass Div.
  - 4. Substitutions: Refer to Section 01600 - Product Requirements.
- B. Clear Float Glass (Type 1) Clear, annealed and tempered.
  - 1. Comply with ASTM C 1048, Condition A uncoated, Type 1 transparent flat, Class 1, Quality q3 glazing select.
  - 2. 3/8 inch minimum thick.
- C. Mirror Glass: Float type, with minimum 4-layer coating consisting of silver, copper, and 2 heat-cured protective coats; tested in accordance with FS DD-M-411
  - 1. Fabrication: Always use gloves when handling mirror glass.
    - a. Fabricate in shop; avoid mechanical and chemical damage to backing.
    - b. Seal edges immediately after fabricating with coating recommended by backing coating manufacturer.
    - c. Wash fronts, backs, and edges with clean water immediately after fabrication.

2.02 SEALED INSULATING GLASS MATERIALS

- A. Manufacturers:
  - 1. Guardian Industries, Falconer Glass Industries.
  - 2. Interpane Glass Co.
  - 3. Viracon, Apogee Enterprises, Inc.
  - 4. Substitutions: Refer to Section 01600 - Product Requirements.
- B. Interior Acoustic Insulated Glass Units: Double pane with special acoustic edge seal.
  - 1. Outer pane of clear glass, inner pane of clear glass.
  - 2. Comply with ASTM E 774 and E 773.
  - 3. Purge interpane space with dry hermetic air.
  - 4. Total unit thickness of 1 inch.
- C. Exterior Insulated Glass Units: Double pane with glass to elastomer edge seal.
  - 1. Outer pane of green tinted, low "e" coated glass, inner pane of clear glass.
  - 2. Comply with ASTM E 774 and E 773.
  - 3. Purge interpane space with dry hermetic air.
  - 4. Total unit thickness of 1 inch.
- D. Edge Seal Construction: Aluminum, bent and soldered corners.

**2.03 GLAZING COMPOUNDS**

- A. Manufacturers:
  - 1. Dow Corning Corp.
  - 2. GE Silicones.
  - 3. Pecora Corp.
  - 4. Substitutions: Refer to Section 01600 - Product Requirements.
  
- B. Silicone Sealant: Single component; chemical curing; capable of water immersion without loss of properties; non-bleeding, non-staining; cured Shore A hardness of 15 to 25; clear color.

**2.04 GLAZING ACCESSORIES**

- A. Manufacturers:
  - 1. Norton Performance Plastics Corp.
  - 2. Pecora Corp.
  - 3. Tremco, Inc.
  - 4. Substitutions: Refer to Section 01600 - Product Requirements.
  
- B. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C 864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
  
- C. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C 864 Option I. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
  
- D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C 864 Option I; black color.
  
- E. Glazing Clips: Manufacturer's standard type.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that openings for glazing are correctly sized and within tolerance.
  
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

**3.02 PREPARATION**

- A. Clean contact surfaces with solvent and wipe dry.
  
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
  
- C. Prime surfaces scheduled to receive sealant.
  
- D. Install sealants in accordance with ASTM C 1193 and FGMA Sealant Manual.
  
- E. Install sealant in accordance with manufacturer's instructions.

**3.03 CLEANING**

- A. Remove glazing materials from finish surfaces.
  
- B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

3.04 PROTECTION OF FINISHED WORK

A. After installation, mark pane with an 'X' by using removable plastic tape or paste. .

3.05 SCHEDULE

A. Aluminum Doors: By door manufacturer.

**END OF SECTION**

## SECTION 09 260 - GYPSUM BOARD ASSEMBLIES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Metal stud wall framing.
- B. Metal channel ceiling framing.
- C. Acoustic insulation.
- D. Gypsum sheathing.
- E. Cementitious backer board.
- F. Gypsum wallboard.
- G. Joint treatment and accessories.

#### 1.02 RELATED SECTIONS

- A. Section 06100 - Rough Carpentry: Building framing system and Gypsum sheathing.
- B. Section 07212 - Board and Batt Insulation: Acoustic insulation.

#### 1.03 REFERENCES

- A. ASTM C 36 - Standard Specification for Gypsum Wallboard; 1995b.
- B. ASTM C 79 - Standard Specification for Gypsum Sheathing Board; 1995.
- C. ASTM C 475 - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 1994.
- D. ASTM C 630/C 630M - Standard Specification for Water-Resistant Gypsum Backing Board; 1996a.
- E. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 1995.
- F. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 1996.
- G. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board; 1996.
- H. ASTM C 931/C 931M - Standard Specification for Exterior Gypsum Soffit Board; 1995a.
- I. ASTM C 1002 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases; 1996.
- J. GA-201 - Using Gypsum Board for Walls & Ceilings; Gypsum Association; 1990.
- K. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association; 1996.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

#### 1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Gypsum Board:
  - 1. G-P Gypsum Corp.
  - 2. National Gypsum Co.
  - 3. United States Gypsum Co.
  - 4. Finish Quality Cement Board:
    - a. James Hardie Building Products.
  - 5. Substitutions: See Section 01600 - Product requirements.

#### 2.02 METAL FRAMING MATERIALS

- A. Non-Loadbearing Framing System Components: ASTM C 645; galvanized sheet steel, size and gage to comply with ASTM C 754 at spacing indicated; maximum deflection L/240 at 5 psf.
  - 1. Studs: C shaped with knurled faces.
  - 2. Runners: U shaped, sized to match studs.
  - 3. Ceiling Channels: C shaped.
  - 4. Furring: Hat-shaped sections, minimum depth of 3/4 inch.
- B. Acoustical Spring Isolation Hangers: Sized for intended loads.
- C. Ceiling Hangers: ASTM C 754.

#### 2.03 GYPSUM BOARD MATERIALS

- A. Standard Gypsum Wallboard: ASTM C 36; sizes to minimize joints in place; ends square cut.
  - 1. Thickness: As indicated.
  - 2. Edges: Tapered.
- B. Moisture-Resistant Gypsum Backing Board: ASTM C 630/C 630M; ends square cut.
  - 1. Thickness: As indicated.
- C. Cementitious Backer Board: High density, glass fiber reinforced, 1/2 inch thick.

#### 2.04 ACCESSORIES

- A. Acoustic Insulation: ASTM C 665; preformed glass fiber, friction fit type, unfaced.
- B. Corner Beads: Galvanized steel.
- C. Trim: ASTM C 840; Bead type as detailed.
- D. Joint Materials: ASTM C 475 and as recommended by gypsum board manufacturer for project conditions.
- E. Screws: ASTM C 1002; self-drilling type.
- F. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit

application; to rigidly secure materials in place.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that project conditions are appropriate for work of this section to commence.

#### **3.02 FRAMING INSTALLATION**

- A. Metal Framing: Comply with ASTM C 754 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members as indicated | at 12 inches on center.
  - 1. Level ceiling system to a tolerance of 1/1200.
  - 2. Laterally brace entire suspension system.
- C. Studs: Space studs at 24 inches on center | as permitted by standard for exterior installations and 16 inches on center for interior installations.
- D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- E. Standard Wall Furring: Install at concrete and masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
  - 1. Orientation: Horizontal.
- F. Blocking: Install blocking for support of plumbing fixtures, toilet accessories, hardware, and other accessories. Comply with Section 06114 for wood blocking | Bolt or screw steel channels to studs.

#### **3.03 GYPSUM BOARD INSTALLATION**

- A. Comply with ASTM C 840 and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
- C. Gypsum Sheathing: Install horizontally, with edges butted tight and ends occurring over firm bearing.
- D. Gypsum Soffit Board: Install perpendicular to framing, with staggered end joints over framing members or other solid backing.
- E. Installation on Metal Framing: Use screws for attachment of all gypsum board except face layer of non-rated double-layer assemblies, which may be installed by means of adhesive lamination.
- F. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum soffit board with sealant.

#### **3.04 CEMENT BOARD PANEL INSTALLATION**

- A. Installation on Metal Framing: Use adhesive and screws for attachment of all cement board panels and as recommended by the panel manufacturer.

#### **3.05 INSTALLATION OF TRIM AND ACCESSORIES**

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

**3.06 JOINT TREATMENT**

- A. Finish all gypsum board in accordance with ASTM C 840 Level 4.
- B. Finish all cement board panel joints and surfaces in accordance with ASTM C 840 Level 4 or as recommended for the finish to be applied.

**3.07 TOLERANCES IN FLAT INSTALLATIONS**

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.
- B. Maximum Variation of Cement Board Panel Surface from True Flatness: 1/8 inch in 10 feet in any direction.

**END OF SECTION**

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## SECTION 09 301 - CERAMIC TILE

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Ceramic and ceramic mosaic tile for floor and wall applications.
- B. Thresholds at door openings.

#### 1.02 REFERENCES

- A. ANSI A108 Series/A118 Series/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 1992.
  - 1. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 1992.
  - 2. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar; 1992.
  - 3. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1992.
  - 4. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1992.
  - 5. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1992.
  - 6. ANSI A118.1 - American National Standard Specifications for Dry-Set Portland Cement Mortar; 1992.
  - 7. ANSI A118.4 - American National Standard Specifications for Latex-Portland Cement Mortar; 1992.
  - 8. ANSI A118.6 - American National Standard Specifications for Ceramic Tile Grouts; 1992.
  - 9. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 1988.
- B. TCA (HB) - Handbook for Ceramic Tile Installation; Tile Council of America, Inc.; 1997.

#### 1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide instructions for using grouts and adhesives.
- C. Samples: Mount tile and apply grout on two plywood panels, 12x12 inch in size illustrating pattern, color variations, and grout joint size variations.
- D. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

#### 1.04 QUALITY ASSURANCE

- A. Maintain one copy of TCA Handbook and ANSI A108 Series/A118 Series on site.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not install adhesives in an unventilated environment.
- B. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

**PART 2 PRODUCTS**

2.01 TILE

- A. Manufacturers: All products by the same manufacturer.
  - 1. American Olean Tile Co.
  - 2. Dal-Tile Corp.
  - 3. Summitville Tiles, Inc.
  - 4. Substitutions: See Section 01600 - Product Requirements.
- B. Ceramic Mosaic Tile: ANSI A137.1, and as follows:
  - 1. Keystones by Dal Tile or approved equivalent product.
  - 2. Size and Shape: 2 inch square.
  - 3. Edges:
    - a. Square: At all location except outside and inside vertical corners and at edge transition of tile to other substrates
    - b. Cushioned: At all inside and outside vertical corners and at edge transition to other substrates.
  - 4. Surface Finish: Unglazed.
  - 5. Colors and Patterns:
    - a. Floors: Standard range in 2 color pattern as indicated on the drawings
- C. Glazed Wall Tile: ANSI A137.1, and as follows:
  - 1. Semi-gloss by Dal Tile or approved equivalent product.
  - 2. Size and Shape: 4-1/4 inch square.
  - 3. Edges: Cushioned.
  - 4. Surface Finish: medium gloss.
  - 5. Walls: Standard range in 1 color field and 2 color accent pattern as indicated on the drawings.
  - 6. Trim Units: Matching bead, bullnose, cove, and base shapes in sizes coordinated with field tile.

2.02 ADHESIVE MATERIALS

- A. Manufacturers:
  - 1. W.R. Bonsal Co.
  - 2. Bostik.
  - 3. Custom Building Products.
  - 4. Substitutions: See Section 01600 - Product Requirements.
- B. Epoxy Adhesive: ANSI A118.3, ANSI A108.4, thinset bond type.

2.03 GROUT MATERIALS

- A. Manufacturers:
  - 1. W.R. Bonsal Co.
  - 2. Bostik.
  - 3. Custom Building Products.
  - 4. Substitutions: See Section 01600 - Product Requirements.
- B. Grout: Latex-Portland cement type as specified in ANSI A118.6.

1. Color: As selected.

#### 2.04 ACCESSORY MATERIALS

- A. Waterproofing Membrane at Floors: .030 inch thick chlorinated polyethylene (CPE) sheet with nonwoven polyester laminated to both sides, 60 inches wide.
- B. Thresholds: Marble type, white color, honed finish, 2x 3/4 inch size (or as detailed) by full width of wall or frame opening, beveled one side radiused edges from bevel to vertical face.

### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within tolerances required for tile installation and ready to receive tile.
- B. Verify that sub-floor surfaces are dust-free, and free of substances which would impair bonding of setting materials to sub-floor surfaces.
- C. Verify that required floor-mounted utilities are in correct location.

#### 3.02 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- D. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

#### 3.03 INSTALLATION - GENERAL

- A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1 through A108.10, manufacturer's instructions, and TCA Handbook recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
  1. Align wall and floor tile so that joints are continuous from one surface to another.
- C. Place thresholds at exposed tile edges.
- D. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- E. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
- F. Form internal angles square and external angles bullnosed.
- G. Sound tile after setting. Replace hollow sounding units.
- H. Allow tile to set for a minimum of 48 hours prior to grouting.
- I. Grout tile joints. Use standard grout unless otherwise indicated.

- J. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

**3.04 INSTALLATION - FLOORS - THIN-SET METHODS**

- A. Over interior concrete substrates, install in accordance with TCA Handbook Method F122, latex-portland cement bond coat, with latex-portland cement grout, unless otherwise indicated.
  - 1. Locations: Toilet 120; Toilet 137; Toilet 147.

**3.05 INSTALLATION - FLOORS - MORTAR BED METHODS**

- A. Over interior concrete substrates, install in accordance with TCA Handbook Method F121, bonded, unless otherwise indicated.
  - 1. Locations: Men 106; Women 104; Toilet 131; Toilet 134.
- B. Cleavage Membrane: Lap edges and ends.
- C. Waterproofing Membrane: Install as recommended by the membrane manufacturer.
- D. Mortar Bed Thickness: 1-1/4 inch, unless otherwise indicated.

**3.06 INSTALLATION - WALL TILE**

- A. Over cementitious backer units install in accordance with TCA Handbook Method W244, using membrane at toilet rooms and kitchens.
- B. Over interior concrete and masonry install in accordance with TCA Handbook Method W202, thin-set with dry-set or latex-portland cement bond coat. Add waterproof membrane at showers.

**3.07 CLEANING**

- A. Clean tile and grout surfaces.

**3.08 PROTECTION OF FINISHED WORK**

- A. Do not permit traffic over finished floor surface for 4 days after installation.

**END OF SECTION**

## SECTION 09 511 - SUSPENDED ACOUSTICAL CEILINGS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

#### 1.02 RELATED SECTIONS

- A. Section 07900 - Joint Sealers: Acoustical sealant.
- B. Section 15940 - Air Outlets and Inlets.
- C. Section 16510 - Lighting Fixtures

#### 1.03 REFERENCES

- A. ASTM C 635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 1995.
- B. ASTM C 636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels; 1996.
- C. ASTM E 580 - Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Moderate Seismic Restraint; 1996.
- D. ASTM E 1264 - Standard Classification for Acoustical Ceiling Products; 1996.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on suspension system components and acoustical units.
- C. Samples: Submit two samples 6x6 inch in size illustrating material and finish of acoustical units.
- D. Samples: Submit two samples each, 12 inches long, of suspension system main runner.

#### 1.05 ENVIRONMENTAL REQUIREMENTS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

#### 1.06 PROJECT CONDITIONS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Install acoustical units after interior wet work is dry.

#### 1.07 EXTRA MATERIALS

- A. See Section 01600 - Product Requirements, for additional provisions.

- B. Provide 5 percent of total acoustical unit area of each type of acoustical unit for Owner 's use in maintenance of project.

## PART 2 PRODUCTS

### 2.01 ACOUSTICAL UNITS

- A. Manufacturers:
  - 1. Armstrong World Industries, Inc.
  - 2. Celotex Corp.
  - 3. USG Interiors, Inc.
  - 4. Substitutions: See Section 01600 - Product Requirements.
- B. Acoustical Units - General: ASTM E 1264, Class A.
- C. Acoustical Panels Type C: Wet formed mineral fiber, conforming to the following:
  - 1. Product: Graphis Wrapped Linear, Tegular Lay-In (24"x24") by Armstrong Ceilings.
  - 2. Location: Lobby, space
- D. Acoustical Panels Type D: Wet formed mineral fiber, conforming to the following:
  - 1. Product: Cirrus Open Plan Beveled Tegular Lay-In (24"x24") by Armstrong Ceilings.
- E. Acoustical Panels Type E: Wet formed high density painted mineral fiber, conforming to the following:
  - 1. Product: Fissured Angled Tegular Lay-In (24"x24") by Armstrong Ceilings.

### 2.02 SUSPENSION SYSTEM(S)

- A. Manufacturers:
  - 1. Armstrong World Industries, Inc.
  - 2. Chicago Metallic Corp.
  - 3. USG Interiors, Inc.
  - 4. Substitutions: See Section 01600 - Product Requirements.
- B. Suspension Systems - General: ASTM C 635; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.
- C. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled, with painted finish; Intermediate-duty.
  - 1. Profile: Tee; 9/16 inch wide face.
  - 2. Construction: Single web.
  - 3. Finish: White.

### 2.03 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Perimeter Moldings: Same material and finish as grid.
  - 1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
- C. Perimeter Caulking: Provide continuous caulked joint between wall and ceiling trim as specified in Section 07900.
- D. Acoustical Sealant For Perimeter Moldings: Specified in Section 07900.
- E. Touch-up Paint: Type and color to match acoustical and grid units.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

#### 3.02 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C 636, ASTM E 580, and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- D. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- H. Do not eccentrically load system or induce rotation of runners.
- I. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
  - 1. Install in bed of acoustical sealant.
  - 2. Use longest practical lengths.
  - 3. Overlap and rivet corners.
- J. Touch up damaged or cut galvanized components as recommended by the manufacturer to prevent rusting.

#### 3.03 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install units after above-ceiling work is complete.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Install cut tiles after all fully uncut tiles have been installed and grid has been adjusted.
- G. Cutting Acoustical Units:
  - 1. Make field cut edges of same profile as factory edges and finish to match factory edge.

END OF SECTION

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## SECTION 09 643 - HARDWOOD FLOORING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Wood strip flooring, nailed.
- B. Secondary subflooring.
- C. Sheet vapor retarder.
- D. Surface finishing.

#### 1.02 REFERENCES

- A. MFMA (SPEC) - Guide Specifications for Maple Flooring Systems; Maple Flooring Manufacturers Association; 1994.
- B. NOFMA (IN) - Installing Hardwood Flooring; National Oak Flooring Manufacturers Association; 1995, Revised 1/97.

#### 1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for flooring, floor finish materials, and base.
- C. Shop Drawings: Indicate floor joint pattern, termination details, and painted floor pattern.
  - 1. Indicate provisions for expansion and contraction.
- D. Samples: Submit two samples 12x12 inch in size illustrating floor finish, color, and sheen.
- E. Installation Instructions: Indicate standard and special installation procedures.
- F. Maintenance Data: Include maintenance procedures.

#### 1.04 QUALITY ASSURANCE

- A. Perform work of this section in accordance with MFMA (SPEC).
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing work of this section with minimum five years experience.

#### 1.05 ENVIRONMENTAL REQUIREMENTS

- A. Do not install wood flooring until wet construction work is complete and ambient air at installation space has moisture content stabilized at maximum moisture content of 40 percent.
- B. Provide heat, light, and ventilation prior to installation.
- C. Store materials in area of installation for minimum period of 24 hours prior to installation or as recommended by the flooring manufacturer if different.

- D. Maintain minimum room temperature of 65 degrees F for a period of two days prior to delivery of materials to installation space, during installation, and after installation.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Hardwood Flooring:
  - 1. Bruce Hardwood Floors.
  - 2. Harris-Tarkett, Inc.
  - 3. Kentucky Wood Floors, Inc.
  - 4. Substitutions: Section 01600 - Product Requirements.

### **2.02 MATERIALS**

- A. Wood Strip Flooring:
  - 1. Species: Northern Hard Maple and Red Oak (stair nosings only).
  - 2. Grade: First.
  - 3. Cut: Flat grain.
  - 4. Moisture Content: 7 to 9 percent.
  - 5. Actual Thickness: 25/32 inch.
  - 6. Actual Width: 1-1/2 inches.
  - 7. Edge: Tongue and Groove.
  - 8. End: End matched.
  - 9. Length: Random, minimum of 9 inches.
- B. Flooring Nails: Type recommended by flooring manufacturer.
- C. Secondary Subflooring: 2 layers 15/32 inch thick plywood, with tongue and groove edges; Exposure 1, sanded, preservative treated.
- D. Vapor Retarder: Black polyethylene sheet, 8 mil thick; 2 inch wide tape for joint sealing.
- E. Sheathing Paper: Plain building paper.

### **2.03 ACCESSORIES**

- A. Ventilating Base: Molded rubber, 4 inch high with a 4 inch toe, ventilating type, with adhesives and accessories, black.
- B. Cushion Blocks: Resilient pads, rubber material, sealed air channels for resiliency; compressible to 1/16 inch under a 40 psi load with full and immediate recovery.
- C. Transition Strip: Same species and finish as flooring material; profiles as indicated.
- D. Floor Finish: Polyurethane, to achieve low sheen surface; type recommended by flooring manufacturer.
- E. Sealer and Wax: Types recommended by flooring manufacturer.

### **2.04 SOURCE QUALITY CONTROL**

- A. Inspect and stamp species and grade on underside of each piece of wood flooring at factory.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that concrete subfloor surface is smooth and flat to plus or minus 1/4 inch in 10 feet.
- C. Verify wood subfloor is properly secured, smooth and flat to plus or minus 1/4 inch in 10 feet.
- D. Verify that required floor-mounted utilities are in correct location.

### 3.02 PREPARATION

- A. Secondary Subflooring: Attach two layers of plywood subflooring directly to existing concrete.
  - 1. Lay the first layer and nail to concrete at 12 inches on center.
  - 2. Place sheathing paper between subflooring layers, lapping edges and ends 2 inches, staple in place.
  - 3. Lay the second layer in the same direction, with edge joints offset 24 inches and end joints offset by one sleeper; nail to sleepers.
- B. Prepare substrate to receive wood flooring in accordance with manufacturer's, MFMA, and NOFMA instructions.
- C. Broom clean substrate.

### 3.03 INSTALLATION

- A. Sheathing Paper: Place over wood subfloor; lap edges and ends 2 inches, staple in place.
- B. Wood Flooring:
  - 1. Install in accordance with manufacturer's, MFMA, and NOFMA instructions; blind nail to wood subfloor.
  - 2. Lay flooring parallel to length of room areas. Verify alignment as work progresses.
  - 3. Arrange flooring with end matched grain set flush and tight.
  - 4. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar; provide divider strips and transition strips in accordance with flooring manufacturer's recommendations and as indicated..
  - 5. Install edge strips at unprotected or exposed edges, and where flooring terminates.
  - 6. Secure edge strips before installation of flooring with stainless steel screws.
  - 7. Install flooring tight to floor access covers.
  - 8. Provide 1/2 inch expansion space at fixed walls and other interruptions.
- C. Install base at floor perimeter to cover expansion space in accordance with manufacturer's instructions. Miter inside and outside corners.
- D. Finishing:
  - 1. Mask off adjacent surfaces before beginning sanding.
  - 2. Sand flooring to smooth even finish with no evidence of sander marks. Take precautions to contain dust. Remove dust by vacuum.
  - 3. Apply finish in accordance with floor finish manufacturer's instructions.
  - 4. Apply filler and three finish coats.
  - 5. Apply first coat, allow to dry, then buff lightly with steel wool to remove irregularities. Vacuum clean and wipe with damp cloth before applying succeeding coat.
  - 6. Lightly buff between coats with steel wool and vacuum clean before applying succeeding coat.
  - 7. Apply painted pattern as indicated on the drawings
  - 8. Apply last coat of finish.

### 3.04 CLEANING

- A. Clean and polish floor surfaces in accordance with manufacturer's instructions.

### 3.05 PROTECTION

- A. Prohibit traffic on floor finish for 48 hours after installation.
- B. Place protective coverings over finished floors; do not remove coverings until Substantial Completion.

**END OF SECTION**

## SECTION 09 650 - RESILIENT FLOORING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Resilient base.
- C. Installation accessories.

#### 1.02 RELATED SECTIONS

- A. Section - 01700 - Construction Procedures: Removal of furniture, equipment and floor mounted accessories.

#### 1.03 REFERENCES

- A. ASTM F 1066 - Standard Specification for Vinyl Composition Floor Tile; 1995.
- B. FS SS-T-312 - Tile, Floor: Asphalt, Rubber, Vinyl, and Vinyl Composition; Federal Specifications and Standards; Revision B, 1974, and Amendment 1, 1979.
- C. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association; 1995.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

#### 1.05 ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).
- B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

#### 1.06 EXTRA MATERIALS

- A. See Section 01600 - Product Requirements, for additional provisions.
- B. Provide 200 sq ft of flooring or 2 percent of the floor area (whichever is less), 40 lineal feet of base, and 5 percent of installed stair materials or of each type and color specified.

### PART 2 PRODUCTS

**2.01 MATERIALS - TILE FLOORING**

- A. Vinyl Composition Tile: ASTM F 1066:
  - 1. Size: 12 x 12 inch.
  - 2. Thickness: 0.125 inch.
  - 3. Vinyl Composition Tile Pattern: Marbelized and solid color as selected by the Architect. Floor design to determined by the Architect using manufacturer's standard tile materials (minimum 2 color tile pattern)
  - 4. Manufacturers:
    - a. Armstrong World Industries, Inc.
    - b. Mannington Mills, Inc.
    - c. Tarkett, Inc.
    - d. Substitutions: See Section 01600 - Product Requirements.

**2.02 MATERIALS - BASE**

- A. Base: Rubber; top set covered:
  - 1. Height: 4 inch.
  - 2. Thickness: 0.125 inch thick.
  - 3. Finish: Satin.
  - 4. Length: 4 foot sections.
  - 5. Color: Color as selected from manufacturer's standards.
  - 6. Accessories: Premolded external corners and end stops.
  - 7. Manufacturers:
    - a. Burke Industries.
    - b. Johnsonite, Inc.
    - c. Roppe Corp.
    - d. Substitutions: See Section 01600 - Product Requirements.

**2.03 ACCESSORIES**

- A. Subfloor Filler: Low VOC, white premix latex; type recommended by adhesive material manufacturer.
- B. Primers and Adhesives: Low VOC, waterproof; types recommended by flooring manufacturer.
- C. Transition Schedule:
  - 1. VCT to carpet: Mercer No. 710.
  - 2. VCT to limited thickness flooring: Mercer No. 633.
- D. Sealer and Wax: Types recommended by flooring manufacturer (water emulsion type).

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that sub-floor surfaces are smooth and flat within tolerances specified in Section 03300 and are ready to receive resilient flooring. In no case shall the tolerances be greater than 1/8" in any ten (10) feet nor greater than 1/16" in a running foot.
- B. Verify that wall surfaces are smooth and flat within tolerances specified in Section 09260, are dust-free, and are ready to receive resilient base.
- C. Verify that concrete sub-floor surfaces are ready for resilient flooring installation by testing for moisture emission rate and alkalinity; Substrates with a Ph reading of 9 or greater shall be neutralized with either an acetic or muriatic acid solution followed by a thorough water rinse. In no case shall the final alkalinity level be more than allowed by the vinyl tile or adhesive manufacturers.

**3.02 PREPARATION**

- A. Remove sub-floor ridges and bumps to acceptable tolerances. Allow floor to dry thoroughly and be free of residue prior to application of leveling compounds. Grind surfaces or fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface. When the leveling compound required to level floor exceeds 3/8", the Contractor shall install multiple layers in accordance with the manufacturer's recommendations, but in no case greater than 3/8" per layer..
- B. Prohibit traffic until filler is cured.
- C. Clean substrate.
- D. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.
- E. Floor surface moisture shall not exceed 3lbs./1000 SF/ 24 hours as measured by means of a calcium chloride test in accordance with the recommendations of the National Rubber Tile Manufacturing Association.

**3.03 INSTALLATION - TILE FLOORING**

- A. Install in accordance with manufacturer's instructions. Apply adhesive evenly.
- B. Mix tile from container to ensure shade variations are consistent when tile is placed.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Set flooring in place, press with heavy roller to attain full adhesion.
- E. Install tile to basket weave pattern. Allow minimum 1/2 full size tile width at room or area perimeter.
- F. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.
- G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated. Secure metal strips before installation of flooring with stainless steel screws.

**3.04 INSTALLATION - BASE**

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Center base work between walls. Except as required in irregularly shaped speces, no base segment shall be less than 1/2 the standard length.
- E. Scribe and fit to door frames and other interruptions.

**3.05 INSTALLATION - TRANSITION STRIPS**

- A. Transition strips shall be full length for openings under 12' in width. If greater than 12", strips shall be spaced to provide equal lengths.
- B. Install transition strips in accordance with manufacturer's recommendations using applicable adhesives.

**3.06 CLEANING**

- A. Remove excess adhesive and other soiling from floor, base, and wall surfaces without damage.

- B. Floors shall not be washed for at least five (5) days after installation. Wash floors with a non-alkaline cleaning solution approved by the flooring manufacturer. Rinse thoroughly with clean, cold water and allow to dry without soiling.
- C. Clean, seal, and wax resilient flooring products in accordance with manufacturer's instructions buffing with an electric polishing machine. Use water emulsion wax as recommended by the flooring manufacturer.

**3.07 PROTECTION OF FINISHED WORK**

- A. Prohibit traffic on resilient flooring for balance of construction period.

**END OF SECTION**

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## SECTION 09 651 - LINOLEUM FLOORING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Linoleum sheet flooring.
- B. Resilient base.
- C. Installation accessories.

#### 1.02 REFERENCES

- A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1996a.
- B. FS SS-T-312 - Tile, Floor: Asphalt, Rubber, Vinyl, and Vinyl Composition; Federal Specifications and Standards; Revision B, 1974, and Amendment 1, 1979.
- C. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association; 1995.

#### 1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

#### 1.04 ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).
- B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

#### 1.05 EXTRA MATERIALS

- A. See Section 01600 - Product Requirements, for additional provisions.
- B. Provide 200 sq ft of flooring or 2 percent of the floor area (whichever is less), 40 lineal feet of base, and 5 percent of installed stair materials or of each type and color specified.

## PART 2 PRODUCTS

### 2.01 MATERIALS - SHEET FLOORING

- A. Linoleum
- B. Backing: Organic.
- C. Total Thickness: 0.080 inch minimum.
- D. Sheet Width: 79 inch minimum.
- E. Basis of Design: Marmoleum as manufactured by Forbo Industries, Inc.
  - 1. Substitutions: See Section 01600 - Product Requirements.
- F. Vinyl Welding Rod: Solid vinyl bead produced by manufacturer of vinyl flooring for heat welding seams, in color matching field color.

### 2.02 ACCESSORIES

- A. Subfloor Filler: Low VOC, white premix latex; type recommended by adhesive material manufacturer.
- B. Primers and Adhesives: Low VOC, waterproof; types recommended by flooring manufacturer.
- C. Sealer and Wax: Types recommended by flooring manufacturer (water emulsion type).

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within tolerances specified in Section 03300 and are ready to receive resilient flooring. In no case shall the tolerances be greater than 1/8" in any ten (10) feet nor greater than 1/16" in a running foot.
- B. Verify that wall surfaces are smooth and flat within tolerances specified in Section 09260, are dust-free, and are ready to receive resilient base.
- C. Verify that concrete sub-floor surfaces are ready for resilient flooring installation by testing for moisture emission rate and alkalinity; Substrates with a Ph reading of 9 or greater shall be neutralized with either an acetic or muriatic acid solution followed by a thorough water rinse. In no case shall the final alkalinity level be more than allowed by the vinyl tile or adhesive manufacturers.

### 3.02 PREPARATION

- A. Remove sub-floor ridges and bumps to acceptable tolerances. Allow floor to dry thoroughly and be free of residue prior to application of leveling compounds. Grind surfaces or fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface. When the leveling compound required to level floor exceeds 3/8", the Contractor shall install multiple layers in accordance with the manufacturer's recommendations, but in no case greater than 3/8" per layer..
- B. Prohibit traffic until filler is cured.
- C. Clean substrate.
- D. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.
- E. Floor surface moisture shall not exceed 3lbs./1000 SF/ 24 hours as measured by means of a calcium

chloride test in accordance with the recommendations of the National Rubber Tile Manufacturing Association.

**3.03 INSTALLATION - SHEET FLOORING**

- A. Install in accordance with manufacturer's instructions.
- B. Spread only enough adhesive to permit installation of materials before initial set.
- C. Set flooring in place, press with heavy roller to attain full adhesion.

**3.04 INSTALLATION - BASE**

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Center base work between walls. Except as required in irregularly shaped spaces, no base segment shall be less than 1/2 the standard length.
- E. Scribe and fit to door frames and other interruptions.

**3.05 INSTALLATION - TRANSITION STRIPS**

- A. Transition strips shall be full length for openings under 12' in width. If greater than 12", strips shall be spaced to provide equal lengths.
- B. Install transition strips in accordance with manufacturer's recommendations using applicable adhesives.

**3.06 CLEANING**

- A. Remove excess adhesive and other soiling from floor, base, and wall surfaces without damage.
- B. Floors shall not be washed for at least five (5) days after installation. Wash floors with a non-alkaline cleaning solution approved by the flooring manufacturer. Rinse thoroughly with clean, cold water and allow to dry without soiling.
- C. Clean resilient flooring products in accordance with manufacturer's instructions.

**3.07 PROTECTION OF FINISHED WORK**

- A. Prohibit traffic on resilient flooring for balance of construction period.

**END OF SECTION**



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## SECTION 09 681 - CARPET

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Recycled Carpet Products, direct-glued.
- B. Accessories.

#### 1.02 ALLOWANCES

- A. See Section 01210 - Allowances, for cash allowances affecting this section.

#### 1.03 REFERENCES

- A. ASTM D 2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 1996.
- B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1996a.
- C. ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 1997.
- D. CRI 104 - Standard for Installation of Commercial Textile Floorcovering Materials; Carpet and Rug Institute; 1994.
- E. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association; 1995.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate seaming plan, method of joining seams, direction of carpet pile and pattern, location of edge moldings and edge bindings.
- C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- D. Samples: Submit two samples 18x18 inch in size illustrating color and pattern for each carpet and cushion material specified.
- E. Submit two, 12 inch long samples of edge strip and base for each color specified.
- F. Carpet and Materials Test Certificates: Provide three (3) copies of Certificate of Compliance from an accredited independent testing laboratory, attesting compliance with the specified standards for the project.
- G. Manufacturer's Installation Instructions: Indicate special procedures.
- H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet with minimum three

years documented experience.

- B. Installer Qualifications: Company specializing in installing carpet with minimum three years experience.

#### 1.06 ENVIRONMENTAL REQUIREMENTS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.
- B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.
- C. Ventilate installation area during installation and for 72 hours after installation.

#### 1.07 EXTRA MATERIALS

- A. See Section 01600 - Product Requirements, for additional requirements.
- B. Provide 100 sq ft of carpeting of each type, color, and pattern specified.

### **PART 2 PRODUCTS**

#### 2.01 CARPET

- A. Carpet:
  - 1. Manufacturer: Interface Carpets.
  - 2. Product: 36" x 36" Tufted Modular Carpet.
  - 3. Pattern: Design Rhythms,color to be selected.
- B. Other Acceptable Manufacturers: Shaw Contract Carpets.

#### 2.02 ACCESSORIES

- A. Sub-Floor Filler: Type recommended by carpet manufacturer. Solvent-free, trowel applied from one of the following manufacturers:
  - 1. TAMMS Floorstone with Latex liquid.
  - 2. GAF Leveling and Patching Compound.
  - 3. Euclid EUCO Polypatch.
  - 4. Flintkote Latex Underlayment.
  - 5. W.F. Taylor #630 Quick Setting Patch.
- B. Base: Rubber, selected color from manufacturer's standard colors and as scheduled on the drawings.
- C. Trim Moldings and Edge Strips: Rubber, selected color from manufacturer's standard colors. Edge strips to have minimum 2 inch anchoring flange.
- D. Adhesives: Compatible with materials being adhered.
- E. Seam Adhesive: Recommended by manufacturer.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that wall surfaces are smooth and flat within tolerances specified in Section 09260, are dust-free, and are ready to receive carpet.
- B. Verify that concrete sub-floor surfaces are ready for carpet installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:
  - 1. Moisture emission rate: Not greater than 3 lb per 1000 sq ft per 24 hours when tested using calcium chloride moisture test kit for 72 hours.
  - 2. Alkalinity: pH range of 5-9.
- C. Verify that required floor-mounted utilities are in correct location.

#### 3.02 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.
  - 1. In areas containing existing vinyl asbestos tile or tile to remain, do not disturb the existing tile surface other than by cleaning. In no case abrade or scarify the existing material surface.
- B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- C. Clean substrate.

#### 3.03 INSTALLATION - GENERAL

- A. Install carpet in accordance with manufacturer's instructions and CRI 104.
- B. Verify carpet match before cutting to ensure minimal variation between dye lots.
- C. Install carpet tight and flat on subfloor, tight to wall with no gaps, well fastened at edges, with a uniform appearance.

#### 3.04 DIRECT-GLUED CARPET

- A. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed. Apply seam adhesive to cut edges of woven carpet immediately.
- B. Apply contact adhesive to floor uniformly at rate recommended by manufacturer. After sufficient open time, press carpet into adhesive.
- C. Apply seam adhesive to the base of the edge glued down. Lay adjoining piece with edge straight, not overlapped or peaked, and free of gaps.
- D. Roll with appropriate roller for complete contact of adhesive to carpet backing.
- E. Trim carpet neatly at walls and around interruptions.
- F. Complete installation of edge strips, concealing exposed edges. Bind cut edges where not concealed by edge strips.

3.05 INSTALLATION ON STAIRS

- A. Use one piece of carpet for each tread and the riser below. Apply seam adhesive to all cut edges.
- B. Install carpet with pile direction in the length of the stair.
- C. Adhere carpet tight to stair treads and risers.

3.06 CLEANING

- A. Remove excess adhesive from floor and wall surfaces without damage.
- B. Clean and vacuum carpet surfaces.

3.07 PROTECTION

- A. Protect carpet from construction traffic until substantial completion
- B. Carpet subjected to excessive traffic and requiring commercial cleaning will not be accepted and shall be cause for replacement.

**END OF SECTION**

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## SECTION 09 720 - WALLCOVERING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Surface preparation and prime painting.
- B. Wall covering.

#### 1.02 REFERENCES

- A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1997a.
- B. ASTM F 793 - Standard Classification of Wallcovering by Durability Characteristics; 1993.
- C. FS L-P-1040 - Plastic Sheets and Strips (Polyvinyl Fluoride); Federal Specifications and Standards; Revision B, 1977.

#### 1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on wall covering and adhesive.
- C. Shop Drawings: Indicate wall elevations with seaming layout.
- D. Samples: Submit two samples of wall covering, 6x6 inch in size illustrating color, finish, and texture.
- E. Manufacturer's Installation Instructions: Indicate special procedures.
- F. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

#### 1.04 QUALITY ASSURANCE

- A. Fire/Smoke Properties: Provide all wall covering with maximum flame and smoke ratings of 25/50 when tested to ASTM E 84.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience and approved by the wall covering manufacturer.

#### 1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Inspect roll materials at arrival on site, to verify acceptability.
- B. Protect packaged adhesive from temperature cycling and cold temperatures.
- C. Do not store roll goods on end.

#### 1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.

- B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.
- C. Provide lighting level of 80 ft candles measured mid-height at substrate surfaces.

**1.07 EXTRA MATERIALS**

- A. See Section 01600 - Product Requirements, for additional provisions.
- B. Supply 25 linear feet of each color and pattern of wall covering; store where directed.
- C. Package and label each roll by manufacturer, color and pattern, and destination room number.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Wall Covering: Vinyl coated fabric roll stock as specified on the drawings.
- B. Accessories:
  - 1. Outside Corner Guard: #85 Outside Corner as manufactured by Koroseal.
  - 2. Color Matched Caulk: At vertical joint locations as supplied by Koroseal.
- C. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.
- D. Termination Trim: Extruded plastic, clear.
- E. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.
- F. Substrate Primer and Sealer: Alkyd enamel type or as recommended by the wallcovering manufacturer..

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that substrate surfaces are prime painted and ready to receive work, and conform to requirements of the wall covering manufacturer.
- B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.
- C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

**3.02 PREPARATION**

- A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.
- B. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.
- C. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- D. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.
- E. Vacuum clean surfaces free of loose particles.

**3.03 INSTALLATION**

- A. Apply adhesive and wall covering in accordance with manufacturer's instructions.
- B. Install accessory items in accordance with manufacturer's instructions.
- C. Apply adhesive to wall surface immediately prior to application of wall covering. Let contact adhesive set tack free.
- D. Use wall covering in roll number sequence.
- E. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.
- F. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface. Butt edges tightly.
- G. Horizontal seams are not acceptable.
- H. Do not seam within 2 inches of internal corners or within 6 inches of external corners.
- I. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.
- J. Do not install wall covering more than 1/2 inch below top of resilient base.
- K. Cover spaces above and below windows, above doors, in pattern sequence from roll.
- L. Apply wall covering to electrical wall plates prior to replacing.
- M. Where wall covering tucks into reveals, or metal wallboard or plaster stops, apply with contact adhesive within 6 inches of wall covering termination. Ensure full contact bond.
- N. Install termination trim.
- O. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

**3.04 CLEANING**

- A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.
- B. Reinstall wall plates and accessories removed prior to work of this section.

**3.05 PROTECTION OF FINISHED WORK**

- A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION

## SECTION 09 851 - FABRIC COVERED ACOUSTICAL PANELS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Fabric-covered fiberglass core panels and mounting accessories.
- B. Fabric-covered fiberglass core ceiling baffles.

#### 1.02 REFERENCES

- A. ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2000.
- B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2000a.
- C. ASTM E 795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests; 2000.

#### 1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, panel layout, and fabric orientation.
- D. Selection Samples: Manufacturer's color charts for fabric covering, indicating full range of fabrics, colors, and patterns available .

#### 1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company with not less than 5 years of experience in manufacturing acoustical products similar to those specified.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical panels from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until panels are needed for installation.
- B. Store panels flat, in dry, well-ventilated space; do not stand panels on end.
- C. Protect panel edges from damage.

#### 1.06 EXTRA MATERIALS

- A. See Section 01600 - Product Requirements, for additional provisions.
- B. Provide 5 percent, but not less than one of each type of panel, for Owner's use in maintenance.

## PART 2 PRODUCTS

### 2.01 ACOUSTICAL PANEL SYSTEM

- A. General
  - 1. Basis of Design: Fabri-Trak as manufactured by Fabri-Trak Systems, Inc.
  - 2. Other Acceptable Manufacturers: Accutrak.
- B. Frame System:
  - 1. Fire retardant, rigid vinyl framework with clamping jaws, one piece section.
    - a. Size: 1 inch wide by 1 inch thick.
    - b. Edge profiles: Provide square edge at all perimeter locations and beveled edges within the body of the panel, as indicated on the drawings.
- C. Acoustical Panel Sub-surface:
  - 1. Provide manufacturer's standard 1 inch thick fiberglass acoustic panel in 6.0# density.
- D. Fabric
  - 1. Fabric: Guilford Fabrics FR-701 series, minimum 66 inches wide.
  - 2. Color: As selected by the Architect from manufacturer's standard colors.

### 2.02 FABRICATION

- A. General: Fabricate panels to sizes and configurations indicated, with fabric facing installed without sagging, wrinkles, blisters, or visible seams.
  - 1. Where radiused or mitered corners are indicated, install fabric to avoid seams or gathering of material.
- B. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 in for thickness, overall length and width, and squareness from corner to corner.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of acoustical panels. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Do not install acoustical wall panel fabric in any space until the following conditions are met:
  - 1. The space has been enclosed and is weather-tight.
  - 2. All wet work has been completed and is dry.
  - 3. Painting is completed and wall base and floor covering have been installed.
  - 4. Adjacent and related work of other trades has been completed including woodwork, masonry, door and frame installation, hardware installation, installation and finishing of gypsum board, installation of wall covering, painting, ceiling work, electrical work, and mechanical work.
  - 5. Ambient temperature and humidity are continuously maintained at values indicated for final acceptance of building occupancy of space.

### 3.02 INSTALLATION

- A. Install acoustical panels in locations indicated, following installation recommendations of panel manufacturer. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.
- B. Field measure each wall area to establish the exact layout in accordance with the drawings.
- C. Install panels to construction tolerances of plus or minus 1/16 in for the following:
  - 1. Plumb and level.

2. Flatness.
  3. Width of joints.
- D. Cut fabric from each roll maintaining the sequence of drops and matching direction of weave.
  - E. Install the fabric from the face side once the framework is securely fastened, to ensure grain alignment and pattern match.
  - F. Stretch fabric over frame and lock into place with high tension to ensure a smooth, flat and secure fabric surface.

**3.03 CLEANING**

- A. Clean fabric facing upon completion of installation from dust and other foreign materials, following manufacturer's instructions.
- B. Trim and remove all loose threads.
- C. Remove surplus materials, trimmed portions of panels, and debris resulting from installation.

**3.04 PROTECTION OF FINISHED WORK**

- A. Provide protection of installed acoustical panels until completion of the Work.
- B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

**END OF SECTION**



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## SECTION 09 900 - PAINTING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints, stains, varnishes, and other coatings.
- C. See Schedule - Surfaces to be Finished, at end of Section.

#### 1.02 RELATED SECTIONS

- A. Section 05500 - Metal Fabrications: Shop-primed items.

#### 1.03 REFERENCES

- A. ASTM D 16 - Standard Terminology Relating to Paint, Varnish, Lacquer, and Related Products; 1996a.
- B. ASTM D 4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 1992.
- C. SSPC (PM1) - Steel Structures Painting Manual, Vol. 1, Good Painting Practice; Society for Protective Coatings; 1993, Third Edition.
- D. SSPC (PM2) - Steel Structures Painting Manual, Vol. 2, Systems and Specifications; Society for Protective Coatings; 1995, Seventh Edition.

#### 1.04 DEFINITIONS

- A. Conform to ASTM D 16 for interpretation of terms used in this section.

#### 1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on all finishing products.
- C. Samples: Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded. Submit on applicable substrate, minimum 12x12 inch in size.
- D. Field Mock-Up: Prepare field mock-up for each substrate and color specified. Mock-up to be prepared in a mutually agreed area and under specified lighting condition for Architect's review. Expect adjustments in tint and shade to final colors.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

#### 1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years experience.

**1.07 REGULATORY REQUIREMENTS**

- A. Conform to applicable code for flame and smoke rating requirements for products and finishes.

**1.08 DELIVERY, STORAGE, AND PROTECTION**

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

**1.09 ENVIRONMENTAL REQUIREMENTS**

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

**1.10 SUSTAINABILITY:**

- A. All products to be manufacturer's lowest VOC material for intended application.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Paints:
  - 1. ICI Paints North America.
  - 2. Benjamin Moore & Co.
  - 3. Sherwin-Williams Co.
  - 4. Duron.
- B. Substitutions: See Section 01600 - Product Requirements.

**2.02 PAINTS AND COATINGS - GENERAL**

- A. Paints and Coatings: Ready mixed, except field-catalyzed coatings. Prepare pigments:
  - 1. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
  - 2. For good flow and brushing properties.
  - 3. Capable of drying or curing free of streaks or sags.

**2.03 PAINT SYSTEMS - EXTERIOR**

- A. Concrete/Masonry, Opaque, Alkyd, 3 Coat:
  - 1. One coat of block filler.
  - 2. Semi-gloss: Two coats of alkyd enamel.
  - 3. Flat: Two coats of alkyd enamel.
- B. Ferrous Metals, Primed, Alkyd, 2 Coat:
  - 1. Touch-up with zinc chromate primer.
  - 2. Gloss: Two coats of alkyd enamel.
  - 3. Semi-gloss: Two coats of alkyd enamel.

- C. Galvanized Metals, Alkyd, 3 Coat:
  - 1. One coat galvanize primer.
  - 2. Gloss: Two coats of alkyd enamel.
  - 3. Semi-gloss: Two coats of alkyd enamel.
  
- D. Pavement Marking Paint:
  - 1. Yellow: One coat, with reflective particles.
  - 2. White: One coat, with reflective particles.
  - 3. Red: One coat, with reflective particles.
  - 4. Blue: One coat, with reflective particles.

#### 2.04 PAINT SYSTEMS - INTERIOR

- A. Wood, Opaque, Alkyd, 3 Coat:
  - 1. One coat alkyd primer sealer.
  - 2. Semi-gloss: Two coats of alkyd enamel.
  - 3. Eggshell: Two coats of alkyd enamel.
  
- B. Concrete/Masonry, Opaque, Acrylic Epoxy, 3 Coat (For use at Kitchen and Restroom wall surfaces).:
  - 1. One coat block filler.
  - 2. Semi-gloss: Two coats of acrylic epoxy
  
- C. Concrete/Masonry, Opaque, Latex, 3 Coat (For use at all wall surfaces except at Kitchen and Restrooms):
  - 1. One coat of block filler.
  - 2. Semi-gloss: Two coats of latex enamel.
  
- D. Ferrous Metals, Unprimed, Alkyd, 3 Coat:
  - 1. One coat of alkyd primer.
  - 2. Gloss: Two coats of alkyd enamel.
  - 3. Semi-gloss: Two coats of alkyd enamel.
  
- E. Ferrous Metals, Primed, Alkyd, 2 Coat:
  - 1. Touch-up with alkyd primer.
  - 2. Gloss: Two coats of alkyd enamel.
  - 3. Semi-gloss: Two coats of alkyd enamel.
  
- F. Galvanized Metals, Alkyd, 3 Coat:
  - 1. One coat galvanize primer.
  - 2. Gloss: Two coats of alkyd enamel.
  - 3. Semi-gloss: Two coats of alkyd enamel.
  
- G. Gypsum Board/Plaster, Latex, 3 Coat:
  - 1. One coat of alkyd primer sealer.
  - 2. Semi-gloss: Two coats of latex enamel.
  - 3. Eggshell: Two coats of latex enamel.
  - 4. Flat: Two coats of latex enamel.
  
- H. Gypsum Board/Plaster, Latex-Acrylic, 3 Coat:
  - 1. One coat of alkyd primer sealer.
  - 2. Gloss: Two coats of latex-acrylic enamel.
  - 3. Semi-gloss: Two coats of latex-acrylic enamel.
  - 4. Eggshell: Two coats of latex-acrylic enamel.
  - 5. Flat: Two coats of latex enamel-acrylic.

#### 2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically

indicated but required to achieve the finishes specified; commercial quality.

- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Inspect existing painted surfaces to receive new paint. Abate all lead contaminated surfaces prior to preparation to receive new finishes.
- B. Verify that surfaces are ready to receive Work as instructed by the product manufacturer.

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- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
  - 1. Plaster and Gypsum Wallboard: 12 percent.
  - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
  - 3. Interior Wood: 15 percent, measured in accordance with ASTM D 4442.

#### **3.02 PREPARATION**

- A. General: Prepare mockup area for prior approval. Area shall be minimum 8' x full height and retained for duration of the work as example of acceptable workmanship.
- B. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- C. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- D. Marks: Seal with shellac those which may bleed through surface finishes.
- E. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- G. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- H. Aluminum Surfaces to be Painted: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
- I. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

- J. Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- K. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
- L. Interior Wood Items to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- M. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

### 3.03 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

### 3.04 CLEANING

- A. Collect waste material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

### 3.05 SCHEDULE - SURFACES TO BE FINISHED

- A. Do Not Paint or Finish the Following Items:
  - 1. Items fully factory-finished unless specifically noted.
  - 2. Fire rating labels, equipment serial number and capacity labels.
  - 3. Stainless steel items.
- B. Paint the surfaces described below under Schedule - Paint Systems.
- C. Mechanical and Electrical: Use paint systems defined for the substrates to be finished.
  - 1. Paint all insulated and exposed pipes occurring in finished areas to match background surfaces, unless otherwise indicated.
  - 2. Paint all equipment, including that which is factory-finished, exposed to weather or to view on the roof and outdoors.
  - 3. Paint shop-primed items occurring in finished areas.
  - 4. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
  - 5. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
- D. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
- E. Spiral Ductwork is NOT to be painted.

### 3.06 SCHEDULE - PAINT SYSTEMS

- A. Concrete, Concrete Block, Brick Masonry: Finish all surfaces exposed to view.
  - 1. Exterior: Flat.
  - 2. Interior: Semi-gloss.
  
- B. Gypsum Board: Finish all surfaces exposed to view.
  - 1. Exterior Soffits: Flat.
  - 2. Interior Ceilings and Bulkheads: Flat.
  - 3. Interior Walls: Eggshell.
  
- C. Wood: Finish all surfaces exposed to view.
  - 1. Exterior trim and frames: Semi-gloss.
  
- D. Steel Doors and Frames: Finish all surfaces exposed to view; semi-gloss.
  
- E. Steel Fabrications: Finish all surfaces exposed to view.
  - 1. Exterior: Gloss; finish all surfaces, including concealed surfaces, before installation.
  - 2. Interior: Gloss.
  
- F. Galvanized Steel: Finish all surfaces exposed to view.
  - 1. Exterior: Semi-gloss
  - 2. Interior: Semi-gloss
  
- G. Shop-Primed Metal Items: Finish all surfaces exposed to view.
  - 1. Finish the following items:
    - a. Exposed surfaces of lintels.
    - b. Elevator pit ladders.
    - c. Exposed surfaces of steel stairs and railings.
    - d. Mechanical equipment.
    - e. Electrical equipment.

**END OF SECTION**

**SECTION 10175**

**PHENOLIC CORE PARTITIONS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Solid phenolic toilet compartments.
- B. Solid phenolic urinal screens.

1.02 RELATED SECTIONS

- A. Section 10810 - Toilet Accessories.

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Show layout of partitions, screens, and compartments.
- C. Product Data: Manufacturer's catalog data on panels, pilasters, doors, hardware and fastening.
- D. Color Charts: Manufacturer's complete range of colors.

**PART 2 PRODUCTS**

2.01 MANUFACTURER

- A. Capital Partitions.
- B. Bobrick.
- C. Substitutions: See Section 01600 - Product Requirements.

2.02 COMPARTMENTS

- A. Toilet Compartments: Solid phenolic.
  - 1. Ceiling hung.
- B. Urinal Screens: Solid phenolic.
  - 1. Wall hung.

2.03 SOLID PHENOLIC MATERIALS

- A. Panels: Solid phenolic core material, compression molded, single piece construction with integral melamine surface and uniformly machined edges; no two-piece construction.
  - 1. Color: As selected from manufacturer's standard finishes.
  - 2. Panel Size: Nominal 1/2 inch thick by 58 inches high, of required depth.
- B. Doors: Same design and construction as specified for panels; nominal 3/4 inch thick by 58 inches high.
- C. Pilasters: Same design and construction as specified for panels and doors; nominal 3/4 inch thick.
- D. Urinal Screens: Same design and construction as specified for panels; nominal 1/2 inch thick.
  - 1. Height: 42 inches.

2. Depth: 18 inches.
- E. Panel Anchors: Heavy extruded brite anodized type 6463T5 aluminum.
  1. Panels to Pilasters: Three U-brackets.
  2. Panels to Wall: Three double ear brackets.
  3. Pilasters to Wall: Continuous single ear bracket (panel height).
- F. Ceiling Hung:
  1. Top hanger: 3/8 inch by 3/4 inch by full width stainless steel bar attached by means of two 5/16 inch bolts into cross dowels and into structural support member with 3/8 inch steel threaded rods with nuts and lock washers.
  2. Conceal ceiling fasteners with a 4 inch high one-piece 18 gage Type 304 stainless steel shoe.
- G. Urinal Screen Anchors:
  1. To Wall: One full length double ear bracket, fastened with 8 wall fasteners.

#### 2.04 HARDWARE

- A. Hardware: Provide all hardware and fasteners for a complete installation.
- B. Door Hinges: 1/8 inch thick heavy extruded brite anodized type 6463T5 aluminum hinges that wrap around both the door and pilaster.
  1. Solid Phenolic: Fasten hinges to door and pilaster with one-way head thru-bolts.
  2. Top Hinges: Opposing nylon cams factory set at 30 degrees open for in-swing and closed for out-swing.
  3. Reinforce top hinge with a 1/4 inch stainless steel rod.
- C. Strike and Latch: Disengages when door is lifted for emergency access.
  1. High density polymer resin combination strike and track fastened to door with two stainless steel screws into threaded brass inserts.
  2. 14 gage stainless steel latch sliding over 12 gage stainless steel keeper fastened to pilaster with two stainless steel tamper-proof screws.
- D. Coat Hook and Wall Bumper: Heavy chrome-plated Zamac fastened with 5/8 inch stainless steel tamper-proof screws.
- E. Fasteners:
  1. Tamper-Proof: "Pro-Star".
  2. Floor and wall fasteners: No. 14 by 1-3/4 inch tamper-proof screws with conical plastic anchors.
  3. All other fasteners: 5/8 inch stainless steel tamper-proof screws or chrome plated brass tamper-proof brass thru-bolts.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install partitions rigid, straight, plumb and level in accordance with manufacturer's instructions.
- B. Set units with not more than 1/2 inch between pilasters and panels and not more than 3/4 inch between panels and walls.
- C. Ceiling Hung: Secure to structural members above ceiling.
- D. Adjust and lubricate hardware for proper operation after installation.
  1. Set hinges on in-swing doors to hold doors in the open or closed position when unlatched as shown on drawings.
  2. Set hinges on out-swing doors to return to the fully closed position.
  3. Remove protective plastic coating.

END OF SECTION



## SECTION 10 523 - FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

#### 1.02 REFERENCES

- A. NFPA 10 - Standard for Portable Fire Extinguishers; National Fire Protection Association; 1998.
- B. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

#### 1.03 PERFORMANCE REQUIREMENTS

- A. Conform to NFPA 10.
- B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate cabinet physical dimensions.
- C. Product Data: Provide extinguisher operational features.
- D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

#### 1.05 ENVIRONMENTAL REQUIREMENTS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Fire Extinguishers, Cabinets and Accessories:
  - 1. JL Industries, Inc.
  - 2. Larsen's Manufacturing Co.
  - 3. Potter-Roemer.
  - 4. Substitutions: See Section 01600 - Product Requirements.

#### 2.02 FIRE EXTINGUISHERS

- A. Dry Chemical Type: Stainless steel tank, with pressure gage.
  - 1. Class B:C.

2. Size 10.
3. Finish: Baked enamel, color as selected.
4. Model: Larsen MP10

#### 2.03 FIRE EXTINGUISHER CABINETS

- A. Metal: Formed primed steel sheet; 0.036 inch thick base metal.
- B. Cabinet Configuration: Recessed type.
  1. Trim: Flat, 1-1/4 inch wide face.
  2. FEC-1 Model: Larsen 2712-R.
  3. FEC-2 Model: Larsen FS-2712-R .
- C. Door: 0.036 inch thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with two butt hinge. Provide nylon catch.
  1. Door Glazing: Glass, clear, 1/8 inch thick float, double strength. Set in resilient channel gasket glazing.
  2. Door Style: Larsen "Vertical Duo".
- D. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.
- E. Finish of Cabinet Interior: White enamel.

#### 2.04 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, galvanized and enamel finished for use with FE-3.
- B. Cabinet Signage: Provide graphic indicator, surface applied, to comply with the Americans with Disabilities Act (ADA).

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

#### 3.02 INSTALLATION

- A. Coordinate fire extinguisher cabinet locations and required openings with other trades.
- B. Install in accordance with manufacturer's instructions.
- C. Install cabinets plumb and level in wall openings, 48 inches from finished floor to inside bottom of cabinet. See drawings for locations of fire extinguishers.
- D. Secure rigidly in place.
- E. Place extinguishers in cabinets.

**END OF SECTION**

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## SECTION 10 525 - EMERGENCY AID DEVICES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Automatic external defibrillators
- B. Accessories
- C. Cabinet

#### 1.02 RELATED SECTIONS

- A. Section 09260 – Gypsum Board Assemblies
- B. Division 16 - Electrical

#### 1.03 QUALITY ASSURANCE

- A. Conform to Americans with Disabilities Act (ADA) 1990 on maximum cabinet projection of 4" and mounting height.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Manufacturer's Data: Submit manufacturer's standard literature describing product, installation requirements, and operating instructions.
- C. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- D. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner 's name and registered with manufacturer.

#### 1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver materials and products to jobsite in original unopened packaging.
- B. Store products at jobsite to ensure protection against damage prior to installation and as recommended by the emergency aid device manufacturer.

#### 1.06 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's standard warranty.

### PART 2 PRODUCTS

#### 2.01 EMERGENCY AID DEVICE (AED)

- A. Defibrillator Unit: Powerheart AED G3 Automatic
  - 1. Text Display: Biphasic waveform and internal memory.
  - 2. 9146 battery.
- B. Carrying Case: For 9300 series AED G3.

- C. Adult Defibrillation Pads
- D. Semi-recessed Wall Storage Case: Provide matching wall storage case with strobe light and security system interlock.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that electrical rough-in and security connection wiring are in place and acceptable. Do not begin installation until deficiencies have been corrected.

**3.02 INSTALLATION**

- A. Install AED in accordance with manufacturer's written instructions and as indicated on the drawings.
- B. Use templates provided by manufacturer.
- C. Securely fasten cabinet to structure, square and plumb, to comply with manufacturer's instructions.
- D. Connect security wiring to AED panel contacts.

**3.03 ADJUSTING**

- A. Adjust work under provisions of Section 01700.
- B. Test installation for proper operation as recommended by the AED manufacturer.

**END OF SECTION**

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## SECTION 10 810 - TOILET ACCESSORIES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Toilet Room Accessories.

#### 1.02 RELATED SECTIONS

- A. Section 04810 - Unit Masonry Assemblies.
- B. Section 10175 - Phenolic Core Toilet Partitions.

#### 1.03 REFERENCES

- A. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines; US Architectural and Transportation Barriers Compliance Board; 1994.
- B. ASTM A 240/A 240M - Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels; 1996a.
- C. ASTM A 554 - Standard Specification for Welded Stainless Steel Mechanical Tubing; 1994 (Reapproved 1995).
- D. ASTM C 1036 - Standard Specification for Flat Glass; 1991.
- E. ASTM F 446 - Standard Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area; 1985 (reapproved 1993).

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's product data for products specified, indicating selected options and accessories.
- C. Shop Drawings:
  - 1. Plans: Locate each specified unit in project.
  - 2. Elevations: Indicate mounting height of each specified unit in project.
  - 3. Details: Indicate anchoring and fastening details, required locations and types of anchors and reinforcement, and materials required for correct installation of specified products not supplied by manufacturer of products of this section.
- D. Verification Samples: Two sample chips of each specified color and finish.
- E. Closeout Submittals: Warranty documents, issued and executed by manufacturer of products of this section, and countersigned by Contractor.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum five (5) years of documented experience producing products of the types specified in this section.
- B. Regulatory Requirements: Conform to ADAAG requirements.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Factory-apply strippable protective vinyl coating to sight-exposed surfaces after finishing of products; ship products in manufacturer's standard protective packaging.
- B. Storage and Protection: Store products in manufacturer's protective packaging until installation.

#### 1.07 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer's standard warranty against defects in product workmanship and materials.
- C. Manufacturer's 15-year warranty against silver spoilage of mirrors.

### **PART 2 PRODUCTS**

#### 2.01 MATERIALS

- A. Stainless Steel Sheet: ASTM A 240/A 240M, Type 304, 18-8 alloy.

#### 2.02 TOILET ACCESSORIES

- A. Basic Construction Requirements:
  - 1. Doors: Fabricated from minimum 0.0313 inch stainless steel sheet, formed hems at sight-exposed edges; welded corners, finished to match sheet finish.
  - 2. Cabinets: Fabricated from minimum 0.0313 inch (0.79 mm)) stainless steel sheet, formed hems at sight-exposed edges; all joints welded, sight-exposed welds finished to match sheet finish.
  - 3. Hinges: Stainless steel piano hinge, 3/16 inch diameter barrel, full length of cabinet; hinge leaves spot-welded to door and cabinet body.
  - 4. Locks: Tumbler locks, keyed alike other toilet accessory locks, with two keys for each lock.
  - 5. Stainless Steel Finish: No.4 satin.
- B. Paper Towel Dispenser and Disposal:
  - 1. Sight-exposed components: Stainless steel, minimum 0.0313 inch thickness.
  - 2. Locks: Tumbler locks, keyed alike other toilet accessory locks, with two keys for each lock.
- C. Toilet Seat Cover Dispenser:
  - 1. Sight-exposed components: Stainless steel, minimum 0.0313 inch thickness.
- D. Sanitary Napkin Disposal:
  - 1. Sight-exposed components: Stainless steel, minimum 0.0313 inch thickness.
  - 2. Locks: Tumbler locks, keyed alike other toilet accessory locks, with two keys for each lock.
- E. Toilet Paper Holder:
  - 1. Sight-exposed components: Stainless steel, minimum 0.0313 inch thickness.
- F. Baby Changing Station:
  - 1. Sight-exposed components: Stainless steel, minimum 0.0313 inch thickness.
- G. Shelving:
  - 1. Sight-exposed components: Stainless steel, minimum 0.0313 inch thickness.
- H. Shower Curtain Rod and Hooks:
  - 1. Sight-exposed components: Stainless steel, minimum 0.0313 inch thickness.
- I. Tool Holder:
  - 1. Sight-exposed components: Stainless steel, minimum 0.0313 inch thickness.

**2.03 SANITATION AND CLEANING SYSTEMS**

- A. Toilet and Urinal Cleaners
  - 1. Dispenser System - Programmable, cleaning fluid/deodorizer dispenser with audible low fluid/battery signalling, battery power indicator, empty refill indicator, refill reset button and keyed lock.
  - 2. Saddle Connection Kit -

**2.04 MIRRORS**

- A. Mirror:
  - 1. Plate Glass Mirror: 1/4 inch thick polished plate glass, ASTM C 1036, Type I, Class 1, quality q1 mirror select; silver-coated, hermetically sealed with uniform electrolytically-deposited copper plating.
  - 2. Size: As indicated on drawings.

**2.05 GRAB BARS**

- A. Grab Bars - Basic Requirements: Fabricated to comply with ASTM F 446 and to withstand a 900 pound force, from ASTM A 554 stainless steel tubing, 0.050 inch, Type 304, 18-8 alloy; formed 1-1/2 inch radius return to wall at each end; each end heliarc-welded to minimum 11 gage stainless steel circular flange; welds finished to match tube finish.
- B. Grab Bars:
  - 1. Sizes and configurations: As indicated on drawings.
- C. Grab Bar Concealed Mounting Flanges: Stainless steel, 3 inch diameter by 1/2 inch deep, with 0.0897 inch steel tenon plate for concealed attachment, using three set screws.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verification of Conditions:
  - 1. Prepared openings are sized and located in accordance with shop drawings.
  - 2. Reinforcement and anchoring devices are correct type and are located in accordance with shop drawings.
- B. Installer's Examination:
  - 1. Have installer of this section examine conditions under which construction activities of this section are to be performed, then submit written notification if such conditions are unacceptable.
  - 2. Transmit two copies of installer's report to Architect within 24 hours of receipt.
  - 3. Beginning construction activities of this section before unacceptable conditions have been corrected is prohibited.
  - 4. Beginning construction activities of this section indicates installer's acceptance of conditions.

3.02 INSTALLATION

- A. Install toilet accessories plumb and level in accordance with shop drawings and manufacturer's printed installation instructions.
- B. Locate toilet accessories at heights specified by Americans with Disabilities Act (ADA).

3.03 CLEANING

- A. Remove manufacturer's protective vinyl coating from sight-exposed surfaces 24 hours before final inspection.
- B. Clean surfaces in accordance with manufacturer's recommendations.

3.04 PROTECTION OF INSTALLED PRODUCTS

- A. Protect products from damage caused by subsequent construction activities.
- B. Field repair of damaged product finishes is prohibited; replace products having damaged finishes caused by subsequent construction activities.

**END OF SECTION**

**ACCESSORY SCHEDULE**

Toilets

Item No.	Accessory	Manufacturer	Model No.
1	Toilet Tissue Holder	Bobrick	B-7685
2	Toilet Seat Cover Dispenser	Bobrick	B-221
3	Fem. Napkin Disposal	Bobrick	B-354

4	Grab Bar 1-1/2" x 3'-0"	Bobrick	B-6806x36
5	Grab Bar 1-1/2" x 3'-6"	Bobrick	B-6806x42
6	Soap Dispenser	Technical Concepts	401310
7	Paper Towel Dispenser/Disposal	Bobrick	B39601
8	Mirror		
9	Baby Changing Station	Bobrick	B-2230

Janitor's Closet

Item No.	Accessory	Manufacturer	Model No.
10	Stainless Steel Shelving	Bobrick	B-295 (12"x18")
11	Tool Holder	Bobrick	B-223
12	Robe Hook	Bobrick	B-2116
13	Paper Towel Dispenser	San Jamar	#T900 TBK, Classic
14	Soap Dispenser	GoJo Industries	Dermapro 9034-12, 800ml

Dressing Room Toilets

Item No.	Accessory	Manufacturer	Model No.
15	Shower Seat	Bobrick	B-5181
16	Shower Curtain Rod	Bobrick	B-6107
17	Vinyl Curtain	Bobrick	204-2
18	Curtain Hooks	Bobrick	204-1
19	Soap Dispenser	Bobrick	B-2112

Sanitation and Cleaning Systems

Item Ltr.	Accessory	Manufacturer	Model No.
A	Toilet/Urinal Cleaner System	Technical Concepts	401188 AutoClean Dispenser
		Technical Concepts	400965 Saddle Connection
		Technical Concepts	400935 Connection Tube
B	Air Freshener System	Technical Concepts	500356 Microburst 9000 LCD

**End of Accessory Schedule**



## SECTION 11 064 - STAGE RIGGING AND DRAPERY

### PART 1 GENERAL

#### 1.01. SUMMARY

##### A. Section includes:

1. Complete and operational Stage Rigging System as described in the Contract Documents.
  - a. Provide all miscellaneous parts, hardware and other components required for proper operation.
  - b. The Drawings TH-0.0 through TH-12.1 correspond to this Section, as well as certain Performance Lighting System drawings that relate to parts of that system integrated into the rigging and mounting distribution equipment elsewhere in the facility.
  - c. Drawings and specifications are complementary. Provide any item of work indicated by the specification but not shown in the drawings, or shown in the drawings but not indicated in the specification as if shown or indicated in both.
2. All scaffolding, ladders, tools and equipment necessary to make the installation.
3. Daily and final cleanup of debris caused by work under this Section.
4. Warranties
5. Documentation and instruction

##### B. Related Sections

1. General & Supplementary Conditions and Division 01 apply to this Section.
2. Unless otherwise noted, the term Contractor shall refer to the Stage Rigging System Contractor.
3. Work excluded from this Section -
  - a. Providing Performance Lighting System components and related mounting hardware.
  - b. Equipment for interface with the fire alarm system.
  - c. Equipment for interface with the sprinkler and/or fire safety curtain deluge system.
  - d. Structural elements used to support the Stage Rigging System and the gridiron, work floor, platforms, galleries and catwalks associated with installing and operating the Stage Rigging System.
  - e. Installation or connections of AC power for the Performance Lighting System, Index Light, motorized projection screens, or elsewhere.
4. Refer to Division 16 for any additional details.

##### C. Alternates -

1. See Section 01 235 Alternates

#### 1.02. REFERENCES

- A. NFPA Life Safety Code
- B. ANSI American National Standards Institute
- C. NEC National Electric Code
- D. NEMA National Electrical Manufacturers Association
- E. AGMA American Gear Manufacturers Association
- F. IEC International Electrotechnical Commission

#### 1.03. SYSTEM DESCRIPTION

- A. Provide all labor, parts, materials, tools, transportation, supervision, coordination, documentation and instruction.
  1. The Stage Rigging and Drapery System shall consist of:
    - a. The number of single-purchase counterweighted line sets shown in the Drawings.
    - b. Lattice guide system for the line sets.

- c. Counterweights.
- d. Stage drapery set with drapery tracks as shown in the Drawings.
- 2. Provide all labor, parts, materials, tools, transportation, supervision, coordination, documentation and instruction for the following:
  - a. Assembling the Stage Electric Battens using distribution strips and mounting brackets supplied under the Performance Lighting section.
  - b. Mounting other distribution equipment as shown in the Drawings, using distribution strips and mounting brackets supplied under the Performance Lighting section.
  - c. Installing rigging to control Performance Lighting AC supply cables, using cable cradles supplied under the Performance Lighting section.

#### 1.04. PRE-QUALIFIED MANUFACTURERS AND INSTALLERS

- A. The following companies have been pre-qualified to provide the equipment, parts, materials and services under this section:
  - 1. J. R. Clancy, Inc./7041 Interstate Island Road/Syracuse, NY 13209 / Telephone:(315) 451-3440/Fax: (315) 451-1766
  - 2. Roberts Stage Curtains/PO box 1086/Travelers Rest, SC 29690/ Telephone:(864) 834-1422 /Fax: (864) 834-1423
  - 3. Texas Scenic Company/5423 Jackwood Drive/San Antonio, TX 78238/ Telephone:(210) 684-0091/Fax: (210) 684-4557
  - 4. SECOA/8650 109th Avenue, N./ Minneapolis, MN 55316/ Telephone: (612) 506-8800/Fax: (612) 506-8844

#### 1.05. OTHER MANUFACTURERS AND INSTALLERS

- A. Manufacturers or Contractors not listed in Paragraph 1.4 may apply to be qualified to bid on this project by submitting a Statement of Qualifications to the Architect for review. The Statement of Qualifications shall include at least these items:
  - 1. Cover letter stating the project name and showing the applicant's business address, telephone number and web site, if any.
  - 2. Proposed itemized equipment list with catalogue cuts and all published technical data for all items specified or reasonably inferred from the Contract Documents.
  - 3. One of the following two statements:
    - a. Contractor: submit a letter from the manufacturer stating that the contractor is authorized to represent the manufacturer.
    - b. Manufacturer: describe the business relationship between the manufacturer and the installer (i.e., installed by manufacturer, or by subcontractor, or by dealer, etc.)
  - 4. Where "sub-contractor" is stated, list previous installations of manufacturer's equipment made by this sub-contractor, if any.
  - 5. Manufacturer shall provide a factory representative to inspect the completed installation by a "sub-contractor" or "dealer" and will include the cost of said inspection in the quote to the sub-contractor or dealer.
  - 6. Statement that the equipment listed has been designed by a professional engineer to meet or exceed the live loads specified in the Contract Documents.
  - 7. List of performance venues where the type of equipment listed in the Statement of Qualifications has been previously installed. List shall include a contact name and telephone number for each installation.
  - 8. State the number of years this manufacturer has been in the business of manufacturing and installing stage rigging and drapery.
  - 9. Copy of Manufacturer's standard form of warranty.

#### 1.06. BID DOCUMENTATION

- A. Verify the accuracy and completeness of the Contract Documents. Verify compatibility with the architectural and structural elements shown in other sections of the Contract Documents. Notify Architect of any discrepancies at least ten days in advance of bid date.
- B. Bid Package documentation -
  - 1. Price in accordance with the Bid Form.

2. Equipment list itemized to match the Bid Form. Include quantities, manufacturer, description and specification number.
3. Statement that the bid is based on the products specified in the Contract Documents.
4. Statement that the Contractor is authorized to represent the manufacturer(s) specified.
5. Statement describing the business relationship between the manufacturer and the installer (i.e., installed by manufacturer, or by subcontractor, or by dealer, etc.)
6. One year Warranty. Detail services that are included and excluded. Warranty shall commence when the Owner has accepted the system.
7. Statement that the Contractor will employ the services of a rigging installation foreman with a minimum of five years experience in installing stage rigging systems, and that the foreman will be in attendance on the job site at any time when rigging installation operations are in progress.
8. Proposal for one year Extended Warranty. Detail services that are included and excluded. If accepted, Extended Warranty proposal shall commence at conclusion of the initial Warranty. Extended Warranty may be annually renewable thereafter at a fee negotiated between the Owner and the Contractor.

**1.07. POST-AWARD SUBMITTALS**

- A. Show Project name, date, Architect, Contractor and this Section number on Submittal documents (Title page only on bound /multiple items).
- B. All materials and equipment supplied under this section shall be new and unused and shall meet or exceed the latest published specification of the manufacturer. The Contractor shall base his bid on the latest model of each piece of equipment that is available at the time of bidding and shall supply the model and type of equipment upon which the bid is based.
- C. Submit five (5) sets of Post-Award Submittals to the Architect within thirty days after award of the Contract.
  1. Product Data shall be neatly bound in binders with tabbed dividers between sections as follows:
    - a. Title page with space for submittal stamps.
    - b. Table of Contents.
    - c. Equipment list for each part of the system with -  
Quantities.  
Manufacturers' model number(s).  
Description and specification paragraph number.  
Denote deviations from specified equipment on this list. Deviations shall be noted in letters of a contrasting color at least 1/4" high.
    - d. Clearly identify each specified item on catalog data sheets and show quantity of each item and/or options available.
    - e. Catalog data sheets for any proposed equipment not included or reasonably inferred from the Contract Documents that the Contractor believes essential for the operation of the system.
  2. Shop Drawings, neatly bound -
    - a. Title page with space for submittal stamps.
    - b. Page(s) with drawing schedule, general notes, symbol and device legends, conventions and any other details pertinent to the entire drawing set.
    - c. Indicate location of each line set, curtain track, electric battens and other rigging devices specified.
    - d. Construction details of custom fabricated items and accepted equipment modifications. Include complete parts lists, schematic diagrams, and dimensions required for proper assembly.
    - e. Indicate proposed colors and finishes for custom fabricated items.
    - f. Show the location of each piece of soft goods specified.
    - g. Provide samples of standard drapery colors and fabrics. State weight per linear yard, fiber content and width for each..
    - h. Scaled Drawings -  
Plans-not less than 1/8" = 1'-0".  
Details-not less than 1/4" = 1'-0".
- D. Submit Product Data Binders and Shop Drawings in one package.
- E. Unless specifically exempted in writing by the Architect, do not commence any work until Post-Award Submittals are accepted.

- F. If the Architect is unable to accept the Post-Award Submittal due to errors, omissions or inaccuracies by the Contractor, the Contractor shall be responsible for costs incurred by the Architect for additional review.
- 1.08. FINAL CONTRACT CLOSE-OUT SUBMITTALS

- A. Provide four complete sets of the following after acceptance of the Final Contract Close-out Submittals and after Observation of rigging operation, but before Owner Instruction-
1. Product Data Binder, neatly bound with tabbed dividers between sections –
  1. Product Data Binder, neatly bound with tabbed dividers between sections -
    - a. Title page.
    - b. Table of Contents.
    - c. Warranty - Warranty statement for a one year system warranty. Clearly explain conditions and limits of warranty and list any items specifically excluded. List components having manufacturers' warranties of more than one year and list length of their warranties. List contractor's name, address, service department telephone number and procedure for obtaining service.
    - d. Equipment list for each System -  
Final quantities  
Manufacturer and model number(s)  
Description of each item
    - e. Equipment manuals -  
Manufacturer's operation manual. This shall be a hard copy manual. "On-line" or electronic manuals are not acceptable.
    - f. Operating Instructions -  
Typed description of each system including: key features, maximum allowable loads, operational concepts and safety procedures.
    - g. Maintenance instructions -  
Routine maintenance procedures and schedules such as physical inspections, lubrication of parts, proper weight distribution for storage, etc.  
Replacement parts lists for major user-replaceable, expendable and/or portable components of the systems, indicating specific part ordering descriptions or numbers.
    - h. One reduced set (11 inches x 17 inches) of installation drawings.
  2. Full-size Project Record Drawings -
    - a. Modify accepted shop drawings to record the actual installation as approved by the Architect.
    - b. Record serial numbers where applicable.
- B. Contractor shall distribute Final Contract Close-out Submittals -
1. Two copies to the Owner or his designated representative during, or no later than the two weeks after the instruction session. Provide four duplicates of each key required for operation of the systems.
  2. Two copies to the Architect no later than two weeks after the instruction session. Provide two duplicates of each key required for operation of the systems with each manual.

1.09. PROJECT CONDITIONS

- A. On-site storage of equipment -
1. Store on-site equipment inside in a manner which will not interfere with the work of other trades.
  2. Do not store or install draperies in dusty conditions or extreme humidity.
  3. Protect stored and installed equipment from damage by others.
- B. Verify job-site conditions related to work under this Section. If irreversible job site conditions are discovered, which require the equipment to be installed in a different manner than indicated, notify the Architect, make recommendations, and proceed with the necessary changes only after receipt of written approval from the Architect. The Contractor will assume responsibility for any loss or damage to the rigging and/or soft goods should he fail to properly document unsuitable on-site conditions.
- C. Remove unnecessary tools and equipment, unused materials, packing materials and debris from each area where work has been completed.
- D. Clean areas around system equipment and verify that each item is properly installed and completely operational.

- E. Coordinate work with other trades and coordinate scheduling with the construction supervisor to minimize delays. Failures in coordination shall not be reason for claim for additional payment.

#### 1.10. WARRANTY

- A. Refer to General Conditions and Supplementary Conditions.
- B. Provide complete warranty repair or replacement of all parts, materials and/or workmanship for one year at no cost to Owner, except in case of obvious abuse. During the warranty period, answer service calls and requests for information within forty-eight hours. Repair or replace faulty items and correct faulty workmanship within seventy-two hours of service calls.
- C. For components having manufacturers' warranties of more than one year, register warranties in the Owner's name and honor those warranties for their entire period.

### PART 2 PRODUCTS

#### 2.01. DESIGN LOAD REQUIRMENTS

- A. Carpenter's battens in this system to be designed to carry a live load of 40 pounds per linear foot of pipe-batten.
- B. Electric battens in this system to be designed to carry a live load of 40 pounds per linear foot of pipe-batten.
- C. Size arbors so that the maximum amount of counterweight cannot exceed the design load for the system.

#### 2.02. COUNTERWEIGHT RIGGING SYSTEM

- A. Furnish and install a complete "T" track-guide single-purchase under-hung counterweight rigging system, as shown in the Drawings.
  - 1. The "T"-track guide system shall be designed and installed to receive the counterweight line sets at the spacing shown in the drawings. Where line sets are omitted, a full and continuous lattice shall be installed to receive additional line sets at some future date.

#### 2.03. COUNTERWEIGHT RIGGING SYSTEM COMPONENTS

- A. Head-block Under-hung:
  - 1. Sheaves shall be 12 inches in diameter, and shall be designed to carry a tread pressure equal to or greater than the pressure imposed on the block by the cables and operating line. Sheaves shall be concentrically bored. Grooves shall be machine cut, polished and sized for the number and size of the cables and for the purchase line. Sheaves shall accommodate a fleet angle of 2° without rubbing.
  - 2. Sheaves shall operate on bearings selected to bear at least 1.5 times the intended sheave load, including the sheave weight, and shall have a guaranteed minimum life of 3,000 hours at 50 RPM. All bearings shall be factory-packed for life with an appropriate lubricant. All shafts for sheaves shall be precision machined cold finished steel, or better, and sized to accommodate the bearing. Shafts shall be prevented from rotating by keeper pins, lock nuts, or a combination of the two.
  - 3. Block side plates shall be steel of a thickness required for the intended sheave load on the block, and shall be attached to each other by no fewer than six (6) bolts and spacers. Bolts shall be rated for the intended load. Spacers shall be devised and installed so as to cause no friction on either the cables or the purchase line. The bolts and spacers shall be so arranged that the sheave cannot fall out of the block once it has been fully assembled. At least two bolt and spacer assemblies spaced 90 degrees apart on the sheave arc shall be so arranged as to prevent the cables from jumping their grooves. The assembled block shall be fabricated and aligned so that the sides of the sheave and the grooves in it revolve in a plane parallel to the sides of the block.
  - 4. Mounting devices for the block shall run at least the full width of the side plates. Mounting devices shall be held rigidly in place to attach the block rigidly to the headwall steel.

B. Loft-block Under-hung:

1. Sheaves shall be 8 inches in diameter, and shall be designed to carry a tread pressure equal to or greater than the pressure imposed on the block by the cable. Sheaves shall be concentrically bored. Grooves shall be machine cut, polished and sized for the cable running through it. Sheaves shall accommodate a fleet angle of 2° without rubbing.
2. Sheaves shall operate on sealed bearings selected to bear at least 1.5 times the intended sheave load, including the sheave weight, and shall have a guaranteed minimum life of 3,000 hours at 50 RPM. All bearings shall be factory-packed for life with an appropriate lubricant. All shafts for sheaves shall be precision machined cold finished steel, or better, and sized to accommodate the bearing. Shafts shall be prevented from rotating by keeper pins, lock nuts, or a combination of the two.
3. Block side plates shall be steel of a thickness required for the intended sheave load on the block and shall be attached to each other by no fewer than five (5) bolts and spacers. Bolts shall be rated for the intended load. Spacers shall be devised and installed so as to cause no friction on the cable and so arranged as to prevent the sheave from falling from the block in the event of a shaft failure. At least two bolt and spacer assemblies spaced 90 degrees apart on the sheave arc shall be so arranged as to prevent the cables from jumping their grooves. The assembled block shall be fabricated and aligned so that the sides of the sheave and the grooves in it revolve in a plane parallel to the sides of the block. Mounting devices for the blocks shall run at least the full length of the block, and shall be designed to hold the block rigidly in place.
4. Provide cable guides (idlers) with each loft block, as indicated in the Drawings, to prevent cables from sagging and rubbing.

C. Tension Floor Block for Purchase Line:

1. Sheaves shall be equipped with a lathe-turned groove sized for the purchase line. Sheaves shall be concentrically bored. The block shall be fabricated from steel side plates and a front plate with an integral toe-kick. The back of the block shall be equipped with two sets of guide shoes with back plates of sufficient size and weight to hold the shoes firmly in place. The guide shoes shall be installed true and square to the block and shall run freely and smoothly on the "T" track. Each block shall weigh not less than thirty (30) pounds.

D. Counterweight Arbor:

1. Arbors shall be designed to integrate with the specified guide system. Top and bottom plates shall be formed from steel plates. Lead lines shall be attached to the top plate in the manner indicated in the Drawings.
2. Arbor uprights shall be solid steel rods, threaded at each end. Rods shall join the arbor head and bottom in such a manner as to prevent the rods from becoming disassembled from the plates during normal operations. Each arbor shall be provided with a continuous strongback fabricated from 1/4"x 2", or larger flatbar secured through the guide shoe attachment holes.
3. Each arbor shall be provided with 1/8" by 2" steel flat bar spacer plates; two (2) per arbor or one (1) per every three feet of arbor, or fraction thereof, which ever is greater. Each arbor upright shall be provided with one (1) thumbscrew locking collar, above the top spacer plate, to secure the top plate in place.
4. Provide each arbor with two (2) sets of guide shoes and back plates, one set attached at the arbor head and one set attached at the bottom. The guide shoes shall be installed true and square to the Arbor and shall run freely and smoothly on the "T" track.

E. Brake and Lock Assembly:

1. Housing shall be a completely enclosed assembly with a one-piece eccentric hand lever and malleable iron cams. Each shall contain shoes for "braking" the purchase line, which shall be mounted on smooth pins or rivets. Each assembly shall be provided with a thumbscrew and lock nut, interfacing with, and for the purpose of adjusting the compression of the braking shoes. When properly adjusted, the brake assembly shall hold against a vertical pull, upwards or downwards on the purchase line, of at least forty (40) pounds.
2. Hand levers to operate the braking shoes shall be a minimum of nine inches (9") long and shall be either cut steel or drop forged. Hand levers shall be smooth finished and covered with a plastic coating in a bright distinctive color. The handle shall have a notch, detent, or protrusion on it to interface with the locking ring.
3. Each assembly shall be equipped with a round or oval steel locking ring (the "lock") with a welded joint. The ring is to be installed around the front purchase line and be of a proper size to pass snugly over the brake handle when the handle is in the Up ("braked") position.

4. Electric's battens brake and lock assembly(s) shall be equipped with a keyed locking device which will prevent the brake from releasing when in the locked position. All key cylinders in this installation shall be keyed alike.

**F. Locking Rail:**

1. The Locking Rail shall be continuous from one end of the counterweight pit opening to the other. The space below the locking shall be filled in an approved manner so as to prevent a ball four inches (0'-4") in diameter, or larger, from passing through it. The locking rail shall serve as a safety rail to prevent persons or objects from stepping or falling into the counterweight pit.
2. The locking rail shall be drilled to receive the Brake and Lock Assemblies at the intervals shown in the Drawings. The steel angle on which the Brake and Lock Assemblies shall be mounted shall not be smaller than three inches (3") by two and one-half inches (2 1/2") by one-quarter inch (1/4") thick. The locking rail shall be rigidly attached to the adjoining structure.

**G. Lead Line:**

1. Wire rope cable used for the lead lines of the counterweight sets shall be aircraft cable of sufficient strength to support the intended load. Damaged and/or deformed cable and cables containing running splices shall not be used. Lead lines shall be fastened together at terminals by compression-type copper oval sleeves intended for this purpose, installed in accordance with the manufacturers' instructions and using the proper tools designated by the manufacturer. Aluminum sleeves are not acceptable. Fleet angles shall not exceed 2° at any location.
  - a. Installed fittings shall be checked for proper swaging with a "GO – NO GO" gauge provided by the manufacturer and in accordance with the manufacturers' instructions. The installer shall warrant that the specific tools and any removable jaws used for installation be traceable and available for inspection at any time, up through and including final inspection.
  - b. Each termination shall be whipped, after final inspection, with heat shrinkable tubing or permanent plastic tape wrapping made for this purpose. ("Friction" tape and common plastic electrical tape will not be accepted.)

**H. Purchase Line:**

1. Purchase line shall be new polyester or manila line, three-quarters of an inch (3/4") in diameter, and shall be free from grease, dirt and foreign matter. Purchase lines for stage electric battens shall be colored blue; all other lines shall be white.

**I. Proof Coil Trim Chain:**

1. Chains shall be provided for each lead line at the batten end. Chain shall be sized for the intended load and shall be fitted with a rated shackle (with screw pin and safety wire) to interface it with the thimble. Wire rope thimbles, sized to match the diameter of the lead line, shall be provided for each lead line at each trim chain. Each chain shall be installed with one (1) wrap around the pipe-batten. Where a snap hook is used, a rated bolt and nut shall be supplied with washers of sufficient size and attached through the links of the chain as shown on the drawings.

**J. Turnbuckle:**

1. Turnbuckles rated for the intended load shall be provided for each lead line at the arbor end. Wire rope thimbles, sized to match the diameter of the lead line, shall provide the interface between the turnbuckle and the lead line. After final adjustment, turnbuckles shall be moused with safety wire in accordance with accepted industry standard practice.

**K. Distribution Plugging Strip:**

1. Mount on each stage electrical batten the appropriate stage distribution plugging strips for each position using the installation brackets supplied with them. Install mounting brackets as shown in the Drawings and elsewhere as needed for stability or as specified by the Performance Lighting equipment manufacturer. Provide instrument batten(s) as shown in the drawings.

**L. Pipe Batten:**

1. Pipe battens for each counterweight line set shall be one and one-half inch (1-1/2") I.D. Schedule 40 black steel pipe. Joints shall be kept to a minimum and shall be made by use of an interior sleeve at least eighteen inches (1'-6") long, and secured with four (4) flush rivets or bolts with lock washers and cap nuts. (Bolts with exposed threads will not be acceptable.)

M. Index Light Fixture:

1. Locate fixture adjacent to the Locking Rail as shown in the Drawings. The Index Light shall be a continuous sheet steel trough with an enclosed wire-way containing lamp sockets for 40 Watt A lamps on 2'-0" centers. The trough shall be devised and installed so that light falls on the locking rail without spilling onto the performance area. The Index Light shall be supported by an outrigger batten the same length as the Locking Rail. Outriggers shall be installed no farther apart than 6'-0" centers or closer if needed for stability. Ends of the Index Light fixture shall be located within eight inches (0'-8") of the length of the locking rail. Connection of the Index Light fixture is to be at the downstage end. For electrical connection see the Electrical Section and Electrical Drawings.

N. Counterweights Steel:

1. Provide counterweights 0'-6" wide in a quantity sufficient to counterbalance the installed system. Provide additional counterweights sufficient to balance two-thirds of the designed live load. All counterweights shall be smoothly finished on all edges and free from rust, scale and oil.

2.04. STAGE SOFT GOODS AND ASSOCIATED ITEMS

A. Traveler Tracks: Traveler Tracks shall be provided at each location shown in the Drawings. Tracks shall meet or exceed the following minimum specifications:

1. Each curtain traveler track shall be fabricated from at least 14 gauge galvanized steel suspended from a Pipe Batten as detailed in 2.3.L. of this Specification, and equipped with assembly clamps spaced at not more than four foot (4'-0") intervals along the entire length of the track. Track shall overlap two feet (2'-0") at the stage centerline. Three assembly clamps shall support the overlap.
2. Tracks shall be equipped with a carrier for each tie line on each draw curtain piece and one master carrier for the leading edge of each draw piece. Each carrier shall be equipped with resilient tires and ball bearings. Each carrier shall be equipped with a trim chain, and the master carriers with two trim chains, each chain to be at least six inches (0'-6") long. A 360-degree swivel shall be provided between each carrier and its corresponding trim chain. Each carrier is to be equipped with a "back pack" device so that the weight of the moving portion of the curtain is distributed evenly over the track and so that the curtain will "stack" at the off-stage ends of the track, rather than below the master carriers.
3. Each draw drapery piece shall be equipped with a check line or chain at the offstage end, connected to the end of the track and to the last carrier. The check line shall prevent the off-stage end of the curtain from traveling to a point adjacent to the edge of the proscenium opening where it can be seen from any seat in the auditorium while permitting the draw curtain to close completely in the center.
4. Each curtain track set shall be provided with an adjustable floor tension block that shall be attached to the stage floor in the manner shown in the Drawings.
5. Each curtain track set shall be provided with a continuous 5/8" diameter cotton draw line with fiberglass center core, to be threaded through carriers and to terminate at the master carriers. Provide resilient silencers between all carriers.

B. Stage Draperies:

Provide set of Stage Draperies with overall finished measurements as shown in the Drawings. This is intended to be a complete set of masking drapery, so that when the drapery is installed and the bottom trim of the borders is set at the trim indicated in the Drawings, no portion of the backstage area or stage rigging can be seen from any auditorium seat.

1. Teaser: Shall be fabricated from 32-ounce velour, color to be selected by the Architect. Fullness of the Valance shall be at least 100 percent. Line with black denim.  
Quantity: 1
2. Front ("House") Curtain: Shall be fabricated from 32-ounce velour, color to be selected by the Architect. Fullness of the Front Curtain shall be at least 100 percent. Line with black denim.  
Quantity: 1
3. Tormentor Leg: Shall be fabricated from fabric and with fullness to match the Front ("House") Curtain.  
Quantity: 1 Pair
4. Mid-stage ("cut-off") and Rear Curtains: Shall be fabricated from 20 ounce black velour with at least 50 percent fullness.  
Quantity: 1 EACH
5. Border: Shall be fabricated from 20 ounce black velour with at least 50 percent fullness.  
Quantity: 4

- 6. Pleated leg: Shall be fabricated from 20 ounce black velour with at least 50 percent fullness.  
Quantity: 4 Pairs
- 7. Sky Piece: Shall be fabricated from seamless gray 120 count scenic muslin.  
Quantity: 1

## 2.05. STAGE SOFTGOODS GENERAL REQUIREMENTS

- A. All Stage Draperies shall be fabricated from an inherently flameproof fabric or shall be treated with a flame-retardant compound, which shall render the fabric appropriate for use in a Class "A" place of assembly. Each piece of drapery shall bear a permanently attached label certifying the flameproof or flame-retardant character of the fabric.
- B. The top finish of each piece of drapery shall include heavy webbing four inches (0'-4") wide, securely stitched in place at top and bottom. Webbing shall be turned under and sewn down at the ends. Seams in the webbing shall be neat, even and finished with no raw edges showing. Solid brass grommets shall be firmly set in the top of each piece at a spacing of not more than eighteen inches (1'-6") center-to-center, and not less than one inch (0'-1") from the top of each piece. Each grommet in each piece shall be furnished with a black drapery tie measuring not less than thirty inches (2'-6") in length before insertion.
- C. Only vertical seams will be permitted. Slash all selvages to prevent drawing.
- D. Side self-facings on curtains and legs shall measure a minimum of twelve inches (1'-0") wide at both ends of each piece, and shall be turned under and securely stitched in place.
- E. Bottom hems of curtains and legs shall be six inches (0'-6") deep, and shall contain a four inch (0'-4") deep bleached cotton muslin pocket for the bottom curtain weight consisting of a continuous length of jack chain. Jack chain shall be of a weight appropriate to the height and weight of the drapery piece so as to cause it to hang straight and true. Chain shall be firmly fastened at the end of each curtain and leg, tacked firmly at each seam, and elsewhere as may be required to prevent the chain from bunching in the pocket.
- F. Border self-facings and hems shall measure four inches (0'-4") and shall be firmly stitched in place.
- G. Where lining is specified, lining shall be made to measurements and fullness consistent with the drapery. Lining shall be separate from the drapery piece and shall be fastened to the drapery using [hook and loop](#) attachments at the top and sides. Bottom hem shall hang free.
- H. Cyclorama or Sky Piece shall be fabricated from 120 count gray scenic muslin of the widest width commercially available. Piece shall be seamless if possible. Where the overall size makes seamless construction impossible, seams shall be horizontal only and shall be kept to a minimum. The top of the sky piece shall be finished with heavy webbing four inches (0'-4") wide and furnished with firmly set solid brass grommets installed not more than one foot (1'-0") apart center-to-center. Each grommet is to be furnished with a black drapery tie measuring not less than thirty inches (2'-6") in length before insertion. The bottom of the Piece shall be finished with an integral pocket into which shall be inserted a pipe-batten fabricated from [three eighths inch \(3/8"\) I.D. schedule 40 steel pipe](#) and assembled as described for battens elsewhere in this section. Reinforce all four corners with a right triangle of face goods measuring twelve inches (1'-0") on each of the two side legs. All aspects of the fabrication of this piece shall permit the piece to be flied with the pipe-batten in the pocket without causing undue strain on the stitching.
- I. All drapery pieces shall be constructed and installed square, true and shall hang naturally without draws, wrinkles or puckers.

## PART 3 EXECUTION

### 3.01. PREPARATION

- A. Verify compliance of the location and access to the following items before beginning installation.
  - 1. Galleries and catwalks adjacent to the location(s) where equipment is to be installed.
  - 2. Installation of the structural members which are intended to support the rigging system.
  - 3. Provision for attachment of the rigging components to the building.

B. Notify the Architect in writing of any discrepancies.

### 3.02. INSTALLATION

#### A. General

1. Execute work in accordance with all local and state codes, ordinances and regulations.

#### B. Personnel

1. Provide a written statement that the on-site personnel directly involved in the installation of this equipment have been engaged in the installation of rigging equipment for a period of at least three years.
2. Provide a written statement that the on-site supervisor directly involved in the installation of this equipment has been engaged in the supervision of the installation of rigging equipment similar in nature to this project for a period of at least seven years. The rigging supervisor shall be in continuous attendance whenever rigging installation is in progress.

#### C. Equipment

1. Verify the quantities of parts and equipment required.

#### D. Site Operations

1. Install rigging parts and equipment according the Contract Documents and approved Shop Drawings.
2. Obtain distribution strip(s) and mounting brackets from the supplier of the Performance Lighting System equipment and connect these items to the rigging and structure as shown in the Drawings.
3. Install traveler tracks.
4. Temporarily balance all line sets.
5. Provide and install a resilient end cap on each pipe batten. End cap shall be bright yellow or safety orange.
6. Install soft goods only after all work that generates dirt, dust, smoke, or sparks on the stage and in the auditorium have been completed. Unpack Draperies on a clean surface. Hang all soft goods as indicated in the Drawings. Clean all soft goods surfaces to remove any dust or debris.
7. Permanently balance all line sets. Paint top weight of each balance-set of counterweights bright yellow or safety orange. Install extra counterweights on the Loading Gallery, evenly distributed and neatly stacked.
8. Verify connection of the electrical cables.
9. Verify connection of the Index Light.
10. Verify the correct operation of each line set.
11. Verify the correct operation and timed descent of the Fire Safety Curtain.

#### E. Labeling

1. Each line set shall be provided with a permanent 3"x5" card-stock plastic-laminated label showing the line set number. Index card shall provide a space below the number for writing a temporary label on the card. All cards shall be white, except electric batten cards which shall be yellow. Permanently label electric batten cards. Index cards shall be affixed to the locking rail by means of metal clips firmly attached to the rail by means of machine bolts or rivets.
2. Provide warning notices at each end of the locking rail and at each end of the loading gallery. Notice shall advise that operating the rigging system can be dangerous and that untrained personnel should not undertake operations. Notice shall also list the maximum allowable weight(s) on the line sets.
3. Framed, engraved, laminated plastic placards calling out the size and weight of each type of counterweight used in the system shall be permanently installed at each end and at the center of the loading gallery, and at one other location as directed by the Owner. Each type of counterweight shall be called out on a separate line. Letters shall be sans serif style, a minimum of 1 1/2" high, white, on a black field.

### 3.03. OBSERVATION OF FINAL TESTS AND OPERATION

A. Schedule a time for the Architect or his designated representative to observe the final tests and operation of the system. Notify the Architect and Construction Manager at least seven days in advance.

- B. Furnish a technician who is familiar with the system to demonstrate to the satisfaction of the Architect or his designated representative that the system is installed in accordance with the intent of the Contract Documents and is fully operational.
- C. Under the direction of the Architect or his designated representative, demonstrate that each line set, traveler, and other mechanical parts of the system operate as intended by the Contract Documents.
- D. If the Architect or his designated representative are unable to perform a complete observation of the system operation due to errors, omissions, problems or inaccuracies by the Contractor, the Contractor shall be responsible for costs incurred by the Architect for additional review.

**3.04. INSTRUCTION**

- A. Furnish a qualified individual to instruct the Owner or his designated representative regarding the design, features and proper operation of the System.
- B. Provide a minimum of four hours of instruction. Coordinate the instruction times through the Architect, Theatre Consultant and the Construction Manager. Following the instruction session, submit copies of documentation showing date, time, systems shown and names of persons attending the instruction session to the following :
  - 1. Architect-two copies.
  - 2. Owner-two copies.

**3.05. ACCEPTANCE**

- A. Upon completion of the work, the Owner may elect to verify the operation of the system as part of the acceptance procedure. Provide personnel and equipment, at the convenience of the Owner, to reasonably demonstrate system performance and to assist with such tests without additional cost to the Owner. These tests and demonstrations are in addition to the instructional requirements outlined in Paragraph 3.4.
- B. Final acceptance of the installation by the Owner and Architect will be based upon the report of the Architect or his designated representative following the Final Observation of System Operation and upon receipt of acceptable Final Contract Close-out Submittals and Instruction documentation.
- C. The failure of a representative of the Owner or Architect to condemn any defective work or material shall not release the Contractor from the obligation to promptly remove and replace the same at any time before final acceptance upon discovery of said defective work or material without claim for additional payment.

**END OF SECTION**



**SECTION 11 130**  
**AUDIOVISUAL SYSTEMS**

**PART 1 GENERAL**

1.01 SUMMARY

A. Definitions

1. The term Owner as used in this specification section and the accompanying AV drawings refers to Fulton County.
2. The term Owner's Representative as used in this specification section and the accompanying AV drawings refers to the Fulton County Construction Manager or other persons so designated by the Owner.
3. The term Consultant as used in this specification section and the accompanying AV drawings refers to CDAI Integrated Technical Solutions or any other Owner-designated Consultant.
4. The term Architect as used in this specification section and the accompanying AV drawings refers to Gardner Spencer Smith Tench & Hensley.
5. The term General Contractor (G.C.) as used in this specification section and the accompanying AV drawings refers to the General Contractor who will be contracted to the Owner.
6. The term Contractor as used in this specification section and the accompanying AV drawings refers to the Audio/Video Systems Contractor who will be subcontractor to the General Contractor (G.C.).
7. The term Electrical Contractor (E.C.) as used in this specification section and the accompanying AV drawings refers to the Electrical Contractor who will be subcontractor to the General Contractor (G.C.).
8. The term Contract Documents as used in this specification section refers to these specifications, the accompanying AV drawings and any enclosures, attachments and addenda which serve to describe or modify the description of the systems to be installed.

B. Provide all materials, labor, equipment, tools, transportation, and utilities, including cost of connection, necessary for successful completion of the Work of this section

C. Any communications with the Owner, Owner's Representative, Architect or Consultant regarding the project shall be in writing. During the bidding period all questions, notifications of discrepancies and requests for product substitutions shall be compiled into a single document and submitted through the Bid Administrator so that it is received at least two (2) weeks prior to the bid submission deadline.

D. Failure by the Contractor to provide any required documentation by the deadlines called for in this specification, including but not limited to Post-Award Submittals, Pre-Delivery Tests, Control System Interface Submittals, Substantial Completion Submittals and Final Contract Close-Out Submittals, shall result in an hourly expediting fees equal to the normal hourly fees currently in effect. The Contractor shall be responsible for paying these fees, any related expenses, and shall assume all responsibility for cost overruns and schedule delays caused by the delayed documentation.

1.02 SUMMARY

A. Includes but not limited to

1. Complete and operational systems as described in the Contract Documents.
  - a. Provide all miscellaneous terminations, hardware and components required for proper operation.
  - b. The Drawings AV0.0 through AV5.1 correspond to this Section.
  - c. Drawings and specifications are complementary. Provide any item of work indicated by the specification but not shown on the drawings, or shown on the drawings but not indicated in the specification, as if shown or indicated on both.
2. Test equipment and tools.
3. Daily and final cleanup of debris caused by work under this Section.
4. Ladders, lifts, hoists or scaffolding required for installation.
5. Warranties.
6. Documentation and instruction.

### 1.03 RELATED SECTIONS

- A. Division 1 - General Requirement
- B. Division 11 – Projection Screens
  
- C. Division 16 - Electrical

### 1.04 SYSTEM DESCRIPTION

- A. Work under this contract includes all labor, materials, cables, tools, transportation services, supervision, coordination, testing, documentation, and instruction necessary to complete the installation of the systems as described in these Specifications and illustrated on the associated Drawings. A summary of these systems is as follows:
  - 1. The Auditorium Performance Sound System is intended to be operated and configured by a trained technician in the sound booth. The system will provide audio reinforcement and program/sound effects playback via a left and right program speaker system with enhanced low end performance. Connections for microphone and line (professional and consumer level) signals will be provided at points around the stage. All connection points on stage shall run to patch bays in the sound booth for flexibility in configuring the system. The system will include a wireless microphone system at the stage manager's rack with both lavalier and handheld wireless microphones. A compliment of loose equipment will be provided including wired handheld & hanging microphones, stands, and cables. The system will include a mid sized mixing console with a compliment of outboard gates, compressor/limiters, equalizers, and multi-effects processors. Inputs and outputs of the mixer and processors shall terminate on patchbays in the sound booth for flexibility in configuring the system. Source gear in the sound booth will include a dual-well cassette recorder and CD player with CD-R/RW/MP3compatibility. Powered speaker systems will be provided for on-stage monitoring or effects playback. An assistive listening system will be provided to meet with ADA compliance. A two channel production communication system will be provided and run from a main station at the stage manager's rack. The production communication system will provide speaker stations or connections for beltpacks throughout the facility and include a compliment of loose beltpacks, headsets, and cables. There will be a distributed ceiling speaker system in the lobby for pre-function programs (announcements and background music).
  - 2. The Auditorium Video Presentation System is intended to be operated by the presenter from the stage. The video presentation system depends on the performance sound system for audio playback. A video projector shall be located in the light booth for front projection of images. The theater will be outfitted with a projection screen hung from a batten and operated by the theater staff. The screen will be designed for frontal projection in a 4:3 format. Sources for the video system will include (owner furnished) computer and auxiliary devices via inputs located in downstage floor boxes in addition to a S-VHS VCR and a DVD player located in an equipment rack off stage right. This equipment rack will also house a video switcher/scaler for routing the various sources to the video projector. The system will include and integrated control system with a touchpanel graphic user interface for ease of use in source selection and source device transport control.
  - 3. The Gallery Audio System shall operate as a stand alone system with feeds from the Auditorium pre-function program audio. The system will provide speech reinforcement and program playback via a distributed ceiling speaker system. A wall mounted attenuator shall be provided for volume control in the Gallery. A wall mounted plate shall provide a microphone input and an auxiliary input for connecting Owner furnished sources. Local audio inputs shall automatically override the Auditorium pre-function program feed.
  - 4. The Auditorium Video Recording/Production System is intended to feed video signals from auditorium locations indicated on the drawings to patchbay locations for external broadcasting and remote feeds. Audio from the auditorium performance sound system shall be fed simultaneously from audio connections at the sound control booth through patchbays to all video feed locations. In addition, the video signal shall be distributed to Green Room 139 for display on Owner's monitor.
  
- B. All finished systems shall be complete and in proper working order, including all necessary cables and appropriate front full closure rack mounting for all equipment as described in these Specifications and illustrated on the associated drawings.
  
- C. It is the sole responsibility of the Contractor to ensure that all systems function as intended by the Contract Documentation. The Contractor shall be responsible for determining and providing the means

and methods of installation for all systems.

#### 1.05 ABBREVIATIONS

A. Abbreviations used in this specification for various societies, organizations, or government bodies shall stand for the following:

1. AES Audio Engineering Society
2. ANSI American National Standards Institute
3. ASA Acoustical Society of America
4. ASTM American Society for Testing and Materials
5. EIA Electronic Industries Association
6. IEEE The Institute of Electrical and Electronics Engineers
7. NAB National Association of Broadcasters
8. NEMA National Electrical Manufacturers' Association
9. NSCA National Sound and Communications Association
10. NTSC National Television Standards Committee
11. RIAA Record Industry Association of America
12. SMPTE Society for Motion Picture and Television Engineers
13. UL Underwriter's Laboratory

#### 1.06 REFERENCES

- A. National Electric Code (NEC)
- B. National Electric Safety Code (NESC)
- C. Giddings, Philip, Audio Systems Design and Installation, Howard W. Sams and Co., Carmel, Indiana, 1990.
- D. Davis, Don & Carolyn, Sound System Engineering, Second Edition, Howard W. Sams and Co., Carmel, Indiana, 1986.
- E. The Master Handbook of Acoustics, Second Addition, McGraw Hill - TAB Books, Blue Ridge Summit, Pennsylvania, 1981
- F. Handbook of Sound Engineers, The New Audio Cyclopedia, Howard W. Sams and Co., Carmel, Indiana, 1991
- G. Television Measurements, NTSC Systems, Tektronix, 1997 Edition
- H. A Guide to Digital Television And Measurements, Tektronix, 1997 Edition

#### 1.07 TEMPORARY UTILITIES

- A. General
  1. Coordinate utilities with Division 1 and the General Conditions for this project.
- B. Electricity
  1. The Owner or General Contractor will provide power to the Contractor within the limits available at the job site at no cost.
  2. Contractor shall provide all temporary wiring, outlets, etc.
    - a. Temporary electrical system shall comply with local codes and Article 305, Temporary Wiring, of the National Electrical Code.
- C. Lighting
  1. Contractor shall provide wiring, outlets, and fixtures for temporary lighting as required.
    - a. Unless arranged for differently, Owner or General Contractor will supply power as specified in Section 01 500.
- D. Heating, Cooling, & Ventilating
  1. Unless arranged for differently, minimal heating and cooling requirements shall be provided at no

cost.

**E. Telephone**

1. Telephone access shall be coordinated with the Owner or General Contractor.
2. Long-distance and toll calls shall be paid for by party making the call.
3. Contractor shall maintain cellular phone service whenever on site.

**F. Water**

1. Owner or General Contractor will allow Contractor usage of water required for construction, within limits available at the job site at no cost.

**G. Fire Protection**

1. Contractor shall provide and maintain on site and in working order one Standard UL Labeled ABC all purpose 10 lb. fire extinguisher.

**1.08 PERMITS & REGULATIONS**

**A. Permits**

1. Contractor shall obtain and pay cost of permits, licenses, fees, and bonds necessary for completion of this Work.
2. Contractor shall secure certificates of inspection and of occupancy that may be required by authorities having jurisdiction over the Work. He shall deliver these certificates to Owner's Representative prior to execution of Certificate of Substantial Completion.

**B. Regulations**

1. Contractor and others working under his jurisdiction shall perform all work in compliance with laws, regulations, and ordinances of any kind required by governmental authority or other agency having jurisdiction over this Work.
2. If Contractor observes that Contract Documents are in variance with any laws, regulations, and ordinances, he shall notify Owner's Representative and shall not proceed unless necessary changes required for compliance with said laws, regulations, and ordinances have been affected as provided in General Conditions. Contractor shall be fully responsible for any work knowingly performed contrary to said laws, regulations, and ordinances and shall fully indemnify Owner against loss and bear all costs and penalties arising therefrom.

**F. General Installation Procedures**

1. Accurately locate the work and components of the work. Make vertical work plumb. Make horizontal work level. Align materials to give smooth uniform surface planes within specified tolerances. Where space is limited, install components to maximize space available for maintenance and to maximize ease of removal for replacement.
2. In finished areas conceal conduit and wiring within construction, unless otherwise indicated. Coordinate exact locations of fixtures and appurtenances with finish elements. If there appears to be a discrepancy or ambiguity in the drawings affecting said locations, Contractor shall notify the Owner prior to proceeding.

- G. Install products in a time and sequence as to preclude cutting and patching and provide the best results.**

**1.09 SECURITY**

- A. Contractor shall coordinate all access to the building with the Owner's Representative or General Contractor.**

- B. Contractor shall be responsible for, and shall retain ownership of, all equipment provided under this contract until Final Acceptance by the Owner (Paragraph 3.10).**

**1.10. SUPPLEMENTARY BIDDING REQUIREMENTS**

- A. These requirements are meant to supplement any Bidding Requirements, Contract Forms and Conditions of the Contract provided by the Owner. In the event of discrepancies, the Owner's Requirements, Forms and Conditions take priority over these Supplementary Requirements. These**

Supplementary Requirements apply to Audiovisual Systems Contractor only, and are not intended to alter the Requirements, Forms and Conditions for any other Contractor on the project.

- B. Verify accuracy and completeness of Contract Documents. Verify the compatibility of products specified, and that all products will function as intended by the Contract Documentation. Notify the Owner's Representative and Consultant in writing of any discrepancies. In the event of discrepancies, written specifications will take priority over drawings and descriptions will take priority over listed model numbers.
- C. Unless specified otherwise elsewhere and in addition to any other Bid Forms or documentation required, Bid Package documentation shall include the following:
1. Pricing for the Systems as follows:
    - a. Equipment- Total price for all products as described in the Contract Documents.
    - b. Engineering - Price for engineering, shop drawing preparation and other labor not directly related to the Systems installation for all systems as described in the Contract Documents.
    - c. Installation- Price for all labor directly related to the installation of all systems as described in the Contract Documents. Include all miscellaneous hardware, consumables, etc. required for installation.
    - d. Taxes- Price of all applicable taxes.
    - e. Warranty- Price for first year warranty as described in Paragraph 1.21 below.
    - f. Bond- Price for Bid Bond and Performance Bond as required by the Contract Documents.
    - g. Total- Total cost for the systems as described in the Contract Documents.
    - h. Provide separate pricing for the base systems and any Alternates described in the Contract Documents.
  2. Itemized equipment list with equipment listed in order with the relevant specification numbers and quantities identified.
  3. Verification of the currently proposed time frame for installation. Prepare and submit a proposed schedule for the project based on the Contract Documents. The schedule shall clearly indicate all critical milestones and deadlines required by the Contract Documents or proposed by the Contractor.
  4. Proposal for a one year Extended Warranty. Detail services included and excluded. If accepted, Extended Warranty proposal shall commence at conclusion of the initial Warranty, see Paragraph 1.21. Extended Warranty may be annually renewable thereafter at a fee negotiated between the Owner and the Contractor.
  5. Proposal for a one year Preventative Maintenance Contract. Proposal to include two site visits, assume at 6 months and one year, to perform manufacturer's recommended product maintenance and routine system maintenance such as cleaning heads, aligning projectors and verifying proper system operation. Proposal shall not include price of standard consumables unless they are part of the manufacturer's recommended maintenance procedures.

#### 1.11. INSTALLERS

A. Approved Installers:

1. Audio-Tech Inc.  
5600 Oakbrook Parkway  
Suite 200  
Norcross, GA 30093-1843  
Contact: Richard Stone  
Phone: (770) 448-3988  
FAX: (770) 448-2922
2. NSync, Inc.  
225 South Peachtree St. NW  
Norcross, GA 30091  
Contact: Dale Marlowe  
Phone: (770) 242-8441  
FAX: (770) 242-8449
3. ISS  
2839 Paces Ferry Rd.

Atlanta, GA 30339  
Contact: Clayton V. Bell  
Phone: (770) 444-0470  
FAX: (770) 432-0060

4. SPL Integrated Solutions, Inc.  
1555 Oakbrook Drive  
Suite 100  
Norcross, GA 30093  
Contact: Rick Landry  
Phone: (770) 849-6200  
FAX: (770) 849-6260

5. TSAV  
398 Foundry St.  
Athens, GA 30601  
Contact: Pete Dugas  
Phone: (706) 613-8759  
FAX: (706) 613-5020

6. MCSI  
2975 Northwoods Parkway  
Norcross, GA 30071  
Contact: Ms. Merrie West  
Phone: (770) 447-1001  
FAX: (770) 441-5286

#### 1.12. CONTRACTOR'S QUALITY CONTROL

##### A. Material Quality

1. Materials incorporated into Project shall be new and of the latest model number, except as otherwise indicated in the Contract Documents, of specified quality, and furnished in sufficient quantity to facilitate proper and speedy execution of the Work.
2. Contractor shall furnish evidence of the quality of materials incorporated into Project as required by the Contract Documents or at request of Owner's Representative or Consultant.
3. Materials not meeting requirements of the Contract Documents shall be removed from Project and replaced with materials meeting Contract Document requirements by Contractor with no additional expense to Owner.

#### 1.13. PRODUCT OPTIONS & SUBSTITUTIONS

- A. Wherever a product or class of material is specified exclusively by a single trade name, name of maker, or by catalog reference in the Contract Documents, use only such specified product unless approval for a Substitution has been secured.
- B. When multiple products are specified in the Contract Documents by name, manufacturer and model number, or as a "Basis of Design" for one use, Contractor may select any one of those specified.
- C. Where multiple acceptable manufacturers, series or product lines are specified in the Contract Documents by name for one use, Contractor may select any one of those listed that meets the specified performance and intent. These products shall not be considered a substitution, however the Contractor must still secure approval for the product being proposed. The onus lies on the Contractor to verify and submit information per Paragraph 1.16.B confirming that the proposed product meets or exceeds the specified performance and intent. There is no guarantee stated or implied by these specifications that the proposed products will be approved.
- D. Where a manufacturer or manufacturers are specified as "or comparable" in the Products section of the Specifications it shall mean that the manufacturer or manufacturers listed compete in the same product categories as the primary listed manufacturer and are known to or can be expected to manufacture a product that provides equivalent functionality, performance and specifications to the primary listed product. These products shall not be considered a substitution; the Contractor must still

secure approval for the product being proposed. The onus lies on the Contractor to verify and submit information per Paragraph 1.16.B confirming that the proposed product meets or exceeds the specified performance and intent. The Contractor may be required to provide cut sheets, samples, technical data or any other information requested to determine equivalence. There is no guarantee stated or implied by these specifications that the proposed products will be approved.

- E. Where the Contractor proposes to substitute products not listed, the onus lies on the Contractor to submit information to verify that the proposed Substitution meets or exceeds the specified performance and intent. The Contractor may be required to provide cut sheets, samples, technical data or any other information requested to determine equivalence. No substitutions shall be permitted without prior written approval. All proposed substitutions shall be submitted in writing to the Owner's Representative. Substitutions proposed during the bid process shall be submitted per Paragraph 1.1.D. There is no guarantee stated or implied by these specifications that proposed substitutions will be approved. Substitutions will only be considered under the following circumstances:
1. The proposed products offer superior performance without adding cost to the Contract.
  2. The proposed products offer equivalent performance and reduce cost to the Contract.
  3. The specified products are no longer available.
  4. The proposed products prevent delays to the project that would be caused by the specified products.
  5. The specified products will not operate as intended due to unexpected field conditions.
- F. Proposed substitutions should specifically identify the reason for the proposal, any effect on other systems or devices and any effect on the installation. Substitutions shall also include sufficient information to identify compliance with the performance and intent shown in the Contract Documents. Any proposals not providing this information shall be subject to summary rejection or non-acceptance.
- G. Proposed substitutions will not be considered if they adversely affect other systems or trades, result in additional cost to the Contract, or require substantial revision of Contract Documents.
- H. In making a formal request for a Substitution, the Contractor represents that:
1. He has investigated the proposed product and has determined that it is equal to or superior in all respects to that specified.
  2. He shall provide the same warranty for Substitution as for the specified product.
  3. He shall coordinate the installation of the accepted Substitution into the work, and shall waive all claims for additional costs related to use of acceptable substitutions that become apparent following acceptance.
- I. Once products have been approved for a use, any changes must be approved in writing by the Owner's Representative and will be considered as a Substitution. Preference will be given to alternate or comparable products listed in the Contract Documents for that use.
- J. Use the same products for the same use throughout the systems.
- K. Use only products from a single manufacturer for similar use throughout the systems unless otherwise specified.
- L. Wherever words "Approved by", "Satisfactory to", "submitted to", "inspected by," or similar phrases are used in these specifications, they shall be understood to mean that the material or item referred to shall be approved by, be satisfactory to, submitted to, or inspected by the Owner's Representative.
- M. Products and materials not specified in the Contract Documents or accepted as approved substitutes and installed in the Work shall be removed and replaced by specified products and materials at no additional cost to Owner and for no additional time added to Contract.

#### **1.14. DELIVERY, STORAGE, & HANDLING**

- A. Materials that are not pre-installed as part of a sub-assembly shall be delivered to the site in original packaging with labels and trademarks intact and such labels and trademarks shall remain intact until used.
- B. Contractor shall confine his apparatus, storage of materials, and operations of his workmen to limits indicated by law, ordinances, and permits and shall arrange and maintain parking of vehicles and

storage of materials in an orderly manner leaving all walks, driveways, roads, and entrances, unencumbered.

C. Protect equipment on site from physical damage and from the elements.

#### 1.15. PROJECT CONDITIONS

A. On-site storage of equipment

1. Store on-site equipment inside in a manner that will not interfere with the work of other trades.
2. Do not store or install equipment in dusty or extreme humidity or temperature conditions, except equipment specifically designed for such conditions.
3. Protect stored and installed equipment from damage by others.

B. Verify job-site conditions related to work under this Section. If irreversible job site conditions are discovered which require the equipment to be installed in a manner different than indicated, notify the Owner's Representative in writing and make recommendations. Proceed with the necessary changes only after receipt of written approval by the Owner's Representative. The Contractor will assume any loss or damage to the equipment should he fail to properly document unsuitable on-site conditions.

C. Remove unnecessary tools and equipment, unused materials, packing materials and debris from each area where work has been completed.

D. Clean areas around system equipment and verify the inside of equipment rack is free of wire strippings and debris.

E. Coordinate work and scheduling with other trades to minimize delays. Failures in coordination shall not be reason for claim for additional payment.

#### 1.16. POST-AWARD SUBMITTALS

A. Show Project name, date, Consultant, Contractor and this Section number on Submittal documents (Title page only on bound /multiple items).

B. Submit five sets of Post-Award Submittals directly to the Owner's Representative within thirty calendar days after the date of award of the Contract. Post-Award Submittals shall consist of Product Data Binders and Shop Drawings.

1. Product Data Binders – Summary of proposed equipment, neatly bound with tabbed dividers between sections, to include:
  - a. Title page with space for submittal stamps.
  - b. Table of Contents.
  - c. Equipment list for each system with
    - 1) Quantities.
    - 2) Manufacturers' model number(s).
    - 3) Description and specification paragraph number.
    - 4) Denote deviations from specified equipment on this list.
  - d. Catalog data sheets arranged to correspond to the specification paragraph number. Clearly mark specification paragraph number on the upper right corner of each sheet. Clearly identify specified item on catalog data sheets showing multiple items or options.
  - e. Catalog data sheets for any proposed equipment not previously accepted per Paragraph 1.13. Any substitutions shall be done in compliance with Paragraph 1.13.
2. Shop Drawings – Drawings prepared by the Contractor for installation. These drawings shall indicate all information necessary for field installation by the Contractor. Shop Drawings shall be submitted as minimum Arch D full size drawings, neatly bound, to include
  - a. Title page with space for submittal stamps.
  - b. Page(s) with drawing schedule, general notes, symbol and device legends, conventions and any other details pertinent to the entire drawing set. No system wiring diagrams should be on this page(s).
  - c. Wiring diagrams for systems showing components and connections between components. Indicate all device, wiring and termination information necessary for field installation by a qualified installer or technician. Components shall show manufacturer, model number(s), description and any pertinent installation details such as internal switch settings, jumper

configurations and card cage slot identification. Wire and cabling shall indicate cable number, type, color and any other pertinent information. Indicate termination types, numbers and locations.

- d. Typical wiring details such as grounding schemes, balanced and unbalanced audio wiring, patchbay wiring and control wiring.
  - e. Equipment rack details including arrangement of equipment, locations of junction boxes and conduit penetrations. Equipment shall indicate manufacturer, model number and function.
  - f. Details of plates and floor box inserts indicating size, finishes, labeling and connectors. Include references to wiring diagrams.
  - g. Labeling for patchbays.
  - h. Details of any custom millwork or cabinetry provided as part of the systems.
  - i. Construction details of custom fabricated items and accepted equipment modifications. Include complete parts lists, schematic diagrams, and dimensions required for proper assembly.
  - j. Indicate proposed colors and finishes for custom fabricated items. Submit color and finish samples where appropriate or as requested by the Owner or Architect.
  - k. Facility floor plans and reflected ceiling plans showing proposed device types and locations. Coordinate availability of electronic documents with the Architect.
- C. Submit Product Data Binders and Shop Drawings in one package. Submittals of only Product Data Binders or of only Shop Drawings shall be considered incomplete and non-conforming.
- D. If the Owner's Representative is unable to accept the Post-Award Submittal (Paragraph 1.16.B) due to errors, omissions or inaccuracies by the Contractor, the Contractor shall be responsible for costs incurred by the Owner's Representative for additional review.

#### 1.17. CONTROL SYSTEM INTERFACE SUBMITTALS

- A. Submit Control System Interface Submittals to the Owner's Representative as soon as possible and at least fourteen calendar days before submitting Substantial Completion Submittals.
1. Proposed touch panel programming loaded on a touch panel equivalent to that being used in the Project. Where multiple types of formats of touch panels will be used, provide one of each type loaded with the appropriate programming.
  2. Proposed engraving for pushbutton panels.
  3. Color printed copies of each major control panel, including any relevant subpanels.
  4. Control system program files using the manufacturer's programming software as required for operation of the proposed touch panel programs and to show system functionality. Program files do not need to be a fully functional system programs, but should allow any control interfaces to operate as proposed. Programs shall include, but not be limited to, the following:
    - a. Page flips or pop-up pages.
    - b. Feedback including variable text, color changes and icons.
    - c. Timing or sequenced events related to the touch panels.

#### 1.18. PRE-DELIVERY SUBMITTALS

- A. Upon completion of the Pre-Delivery Tests (Paragraph 3.5) and before systems have been delivered to the site, submit two complete sets of test reports to the Owner's Representative. Submittals shall include:
1. Results of Pre-Delivery Tests and on-site conditions.
  2. Description of corrective procedures and adjustments.
  3. Resulting performance of each system after adjustments.

#### 1.19. SUBSTANTIAL COMPLETION SUBMITTALS

- A. Upon completion of the Post-Delivery Test and the Audio Systems Adjustment Equalization and when the systems are substantially complete, but before Final Tests, submit two complete sets of submittals directly to the Owner's Representative. Submittals shall include:
1. Results of the Substantial Completion Tests and Adjustments.
  2. Hardware and software equipment settings.
  3. Description of corrective procedures and adjustments.
  4. Resulting performance of each system after adjustments.
  5. Full-size Project Record Drawings

- a. Modify accepted shop drawings to record the actual installation as of the completion of Substantial Completion Tests and Adjustments in Paragraph 3.6.
- b. Record serial numbers for permanently mounted electronic devices.
- c. Indicate actual location of devices.
6. Written verification that the systems are substantially complete.
7. A list of any known outstanding work or equipment other than the Final Tests, Instruction and Final Cleaning in Paragraphs 3.8, 3.9 and 3.10.

B. Substantial Completion for these systems shall not be dependent upon or limited by the Certificate of Substantial Completion for the project and shall be defined as:

1. Systems are functional as defined by the Contract Documents.
2. All permanently installed equipment is in place and properly installed.
3. All portable equipment required for operation is on site.
4. Substantial Tests and Adjustments are complete.
5. The systems are ready for Final Tests.
6. The systems are ready for use by the Owner.
7. Written confirmation that comments from previous submittals, Addenda, and other contract correspondence have been addressed.

#### 1.20. FINAL CONTRACT CLOSE-OUT SUBMITTALS

A. Submit one preliminary copy to the Owner's Representative following Final Tests and before Owner Instruction (Paragraphs 3.7 and 3.8). Provide one of each key required for operation of the systems. This preliminary copy will be reviewed and returned to the Contractor with comments to be incorporated into the final submittals. These submittals shall include:

1. Product Data Binder, neatly bound with tabbed dividers between sections
  - a. Title page.
  - b. Table of Contents.
  - c. Warranty
    - 1) Warranty statement for a one year system warranty. Clearly explain conditions and limits of warranty and list items specifically excluded, such as light bulbs, fuses, normal wear/tear or expendable items.
    - 2) List components having manufacturers' warranties of more than one year and list length of their warranties.
    - 3) List contractor's name, address, service department telephone number and procedure for obtaining service.
  - d. Equipment list for each System
    - 1) Final quantities.
    - 2) Manufacturer and model number(s).
    - 3) Description of each item.
  - e. Equipment Manuals
    - 1) Manufacturers' operation manuals, arranged alphabetically.
    - 2) List manufacturers' addresses for products not included above.
  - f. Operating Instructions
    - 1) Typed description of each system including: key features and operational concepts (e.g., mixing and linking capabilities); short nontechnical instructions for basic set-up & operation; detailed descriptions of advanced features, signal routing and control functions; basic trouble-shooting procedures in a tabular-type problem/solution format.
    - 2) Set-up diagrams and typed instructions for use in typical situations, as requested by the Owner's Representative.
  - g. Maintenance Instructions
    - 1) Routine maintenance procedures such as head cleaning, receptacle plate/connector inspection, lamp replacement, cosmetic cleaning, fuse replacement, etc. It is acceptable to reference the Equipment Manuals where appropriate.
    - 2) Replacement parts lists for major user-replaceable, expendable and/or portable components of the systems indicating specific part ordering numbers.
  - h. Test reports of electrical and electronic tests showing final measurements (Paragraphs 3.6 and 3.7).
  - i. Tables or detail drawings showing final settings on amplifiers, limiters, equalizers, signal delays and other controls not usually adjusted by the end-user, after Final Tests (Paragraph 3.7).
  - j. One reduced set (11 inches x 17 inches) of block diagram drawings.

2. Full-size Project Record Drawings
    - a. Modify accepted shop drawings to record the actual installation as approved during Final Tests (Paragraph 3.7).
    - b. Record serial numbers for permanently mounted electronic devices.
    - c. Indicate actual location of devices.
  3. Software and Programming-
    - a. Complete electronic copies of all software files and programs shall be submitted on CD-R to the Owner's Representative upon Final Acceptance and again after any modifications during the warranty period. The information submitted shall include, but not be limited to, control system source code (including touch panel layouts and infrared and serial drivers), DSP and other data files, and all manufacturers' software used in programming or setting up the systems. All project specific software, data and programming files needed to support or maintain the Systems shall be included.
    - b. Contractor shall provide a list of all software and device passwords used to the Owner upon Final Acceptance.
    - c. Contractor grants the rights to the Owner to use this information to support and maintain the systems part of this Contract.
- B. Submit two final copies with revisions to the Owner's Representative during, or no later than two weeks after, the instruction session. Provide four duplicates of each key required for operation of the systems.

#### 1.21. WARRANTY

- A. Provide complete warranty repair or replacement of products and workmanship for one year at no cost to Owner, except in case of obvious abuse. During the warranty period, answer service calls and requests for information within forty-eight hours. Repair or replace faulty items and correct faulty workmanship within seventy-two hours of service calls.
- B. For components having manufacturers' warranties of more than one year, register warranties in the Owner's name and honor those warranties for their entire period.
- C. During the warranty period, provide manufacturers' software updates if the updates incorporate corrections to deficiencies or 'bugs' in the software initially provided with the systems.
- D. Initial warranty period for all systems commences at owner's final acceptance of system. Initial systems warranty period does not commence when products are received on site, at substantial completion or when owner begins using systems. Initial individual product warranties commence upon owner's final acceptance of the system or Owner's first use after Substantial Completion of the system.
- E. Contractor warrants all Equipment and Software that either contain or utilize a date chip or system clock, or will otherwise process date data, to be "Millennium Compliant." Contractor will provide written documentation from the Equipment/Software manufacturer certifying "Millennium Compliance" upon written request by the Owner or Consultant. The term "Millennium Compliant" means
  1. The Equipment/Software will perform the functions, calculations and other computing processes that it performs (collectively, the "processes") consistently well without regard to either the date on which the Equipment/Software performs the Processes or the date input to the Equipment/Software whether that date is one occurring before, on or after January 1, 2000.
  2. If the Equipment/Software stores and displays date information, it will present that information in a defined, pre-determined way that it is unambiguous as to the century being displayed.

## **PART 2 PRODUCTS**

### 2.01. QUANTITIES

- A. Unless otherwise noted, quantities are indicated on the drawings.
- B. Specifications: All specified performance requirements shall be considered a minimum acceptable

performance unless stated otherwise.

- C. All products shall be new and shall be a manufacturer's current model at the time of acceptance of Post-Award Submittals or later. Used, "B Stock" or discontinued products are not acceptable unless specifically identified as such and accepted by the Owner's Representative in writing.

## 2.02. AUDIO PRODUCTS

A. Wireless Microphone System: All components must be of same manufacturer.

1. Receiver:
  - a. True diversity frequency agile UHF operation.
  - b. Dual discrete receivers.
  - c. Dual discrete balanced line outputs.
  - d. Front Panel Metering: RF signal strength, audio signal level and transmitter battery level metering for both transmitters.
  - e. Headphone monitor.
  - f. Rack mounted.
  - g. Quantity: Four (4)
2. Handheld microphone with built in transmitter:
  - a. Frequency agile operation.
  - b. Internal antenna.
  - c. Cardioid pick-up pattern.
  - d. Locking on/off switch.
  - e. All metal construction.
  - f. Minimum 8 hour battery life.
  - g. Battery life, operating channel and power indicators.
  - h. Quantity: Four (4)
3. Bodypack transmitter:
  - a. Frequency agile operation.
  - b. All metal construction.
  - c. Minimum 8 hour battery life.
  - d. Battery life, operating channel and power indicators.
  - e. Quantity: Eight (8).
4. Miniature lavalier microphone for use with bodypack transmitter:
  - a. Frequency Response: 20Hz-20kHz.
  - b. Pattern: Omnidirectional.
  - c. Sensitivity: -40 dBV/Pa.
  - d. Color: Tan.
  - e. Quantity: Eight (8).
5. Acceptable: Shure U Series or comparable by Audio-Technica, Electrovoice or Sennheiser .

B. Antenna Distribution System: Must be of same manufacturer as Wireless Microphone System.

1. Diversity operation.
2. Insertion loss compensation.
3. Outputs: To support specified wireless microphone systems.
4. Rack mounted.
5. Provide with two ½ wave extension antenna systems, all necessary hardware and cabling.
6. Acceptable: Shure U Series or comparable by Audio-Technica, Electrovoice or Sennheiser.

C. Handheld Microphone: Provided as loose equipment for general purpose use on stage.

1. Element: Dynamic.
2. Polar Pattern: Supercardioid.
3. Frequency Response: 50-16k Hz (+/- 3 dB) @ 30 degrees.
4. Integrated pop filter.
5. Acceptable: Shure Beta57A or comparable by Audio-Technica, Electrovoice or Sennheiser.
6. Quantity: Eight (8).

D. Hanging Microphone: Provided as loose equipment for use over the stage.

1. Element: Condenser.
2. Polar Pattern: Supercardioid.
3. Frequency response 50Hz-17kHz.
4. In-line preamp.

5. Phantom powered.
  6. Acceptable: Shure MX202 or comparable by Audio-Technica, Electrovoice or Sennheiser .
  7. Quantity: Two (2).
- E. Stereo Microphone: For archival recording and ALS use and located on the lighting galley.
1. Single point stereo microphone with dual condenser cardioid elements in x/y configuration.
  2. Outputs: Dual discrete balanced outputs.
  3. Frequency response 30Hz-20kHz.
  4. Integral preamp.
  5. Phantom powered.
  6. Contractor to provide all necessary hardware to permanently suspend microphone from lighting catwalk
  7. Acceptable: Audio-Technica AT825 or comparable by Crown, Shure or Sennheiser.
  8. Quantity: Two (2).
- F. Microphone Extension Cable, 50': Provided as loose equipment.
1. Cable: 2 conductor with overall shield.
  2. Length: 50'.
  3. Jacket: Flexible vinyl, rubber or neoprene.
  4. Terminations: Male 3 pin XLR to female 3 pin XLR.
  5. Color: Black.
  6. Acceptable: Shure C50J or comparable by Audio-Technica , ProCo, or Whirlwind.
  7. Quantity: Four (4)
- G. Microphone Extension Cable, 25': Provided as loose equipment.
1. Cable: 2 conductor with overall shield.
  2. Length: 25'.
  3. Jacket: Flexible vinyl, rubber or neoprene.
  4. Terminations: Male 3 pin XLR to female 3 pin XLR.
  5. Color: Black.
  6. Acceptable: Shure C25J or comparable by Audio-Technica , ProCo, or Whirlwind.
  7. Quantity: Eight (8)
- H. Microphone Stand.
1. Height: 37"-66" adjustable.
  2. Weight: Minimum 14 lbs.
  3. Base: 12" diameter.
  4. Non-reflective finish.
  5. Acceptable: Atlas MS-20E or comparable by AKG, Audio-Technica or Beyerdynamic.
  6. Quantity: Eight (8).
- I. CD/MP3 Player: Single Disc CD player.
1. Instant Start.
  2. CD-R/RW playback compatibility.
  3. MP3 playback compatibility.
  4. Functionality: Continuous play, single play, random play, repeat play, program play, pitch control.
  5. Outputs: Balanced line-level outputs.
  6. Rack mounted.
  7. Acceptable: Denon DN-C635 or comparable by Marantz or Tascam.
- J. Dual Cassette Recorder:
1. Fully independent wells and transport controls.
  2. Functionality: Dolby B/C/HX Pro, Normal and high-speed dubbing, music search, memory rewind, pitch control.
  3. Inputs: Independent balanced line-level inputs.
  4. Outputs: Independent balanced line-level outputs.
  5. Rack mounted.
  6. Provide with: Output balancing kit.
  7. Acceptable: Marantz PMD510 or comparable by Denon or Tascam.
- K. Dynamics Processor: Four Channel Compressor/Expander/Limiter.

1. Compressor Ratio: 1:1 to 50:1.
  2. Switchable knee compression curve.
  3. Attack: 50us to 20 ms, Release: 60ms to 2 s.
  4. Distortion: <0.03% @ +4dBu (1kHz).
  5. Noise: <-94dBu (20Hz-20kHz unweighted).
  6. Frequency Response: 20Hz-20kHz (+/-0.5dB).
  7. Acceptable: Klark-Teknik DN504 or comparable by BSS, dbx, or Presonus.
- L. Quad Gate: Four Channel Auto Gate.
1. Frequency Response: 20Hz-20kHz (+/-0.5dB).
  2. Distortion: <0.03% @ +4dBu (1kHz).
  3. Noise: <-100dBu gate open.
  4. Attack time: 5us – 2ms, Hold/Release: 40 ms – 2s.
  5. Acceptable: Klark-Teknik DN514 or comparable by BSS, dbx, or Presonus.
- M. Dual Channel Equalizer: Dual Channel, 1/3 Octave Graphic Equalizer.
1. 2 x 30 precision faders providing 12dB of attenuation and accentuation.
  2. Frequency Response: 20Hz-20kHz (+/-0.5dB).
  3. Noise: <-90dBu (20Hz – 20kHz).
  4. XLR inputs and outputs.
  5. Acceptable: Klark-Teknik DN360 or comparable by BSS, dbx, or Presonus.
- N. Effects Processor: 24-bit Dual Channel Processor.
1. 24-bit A/D, D/A, and internal processing.
  2. Built-in digital compressor.
  3. 200+ programmed presets including Ambience, Plate, Chamber and Inverse, as well as Tremolo, Rotary, Chorus, Flange, Pitch, Detune, 5.5 second Delay and Echo.
  4. Acceptable: Lexicon MPX200 or comparable by tc Electronic, Yamaha.
- O. Multi-Effects Processor: Digital Multi-Effects Processor.
1. 80 preset programs, 100 user programs.
  2. Preset programs include compression, expansion, EQ, echo, delay, reverb, modulation, and pitch change algorithms.
  3. Acceptable: Yamaha SPX990 or comparable by Lexicon, tc Electronic.
- P. Line-level Audio Patchbay: Bantam jackfield, broadcast quality patchbay.
1. 2 x 48 configuration.
  2. Tip, ring, and sleeve normals brought out.
  3. Separate front panel and wiring connection modules with 4' umbilical interconnect.
  4. Provide as normalled, half normalled, or non normalled as per Drawings.
  5. Acceptable: ADC BJB403-4MKIVSN or comparable by Canare, Switchcraft .
- Q. Bantam-Bantam Patch Cables: Patch cables for use with line-level audio patchbays.
1. Three conductor.
  2. Provide red, green, blue, yellow colors as shown below.
  3. Provide 1 foot & 2 foot lengths as shown below.
  4. Provide with patch cable hanger..
  5. Acceptable: ADC R1B, R2B, G1B, G2B, B1B, B2B, Y1B, & Y2B or comparable by Canare, Switchcraft .
  6. Quantity: Four (4) each.
- R. Mic Patchbay: For patching of mixing console inputs.
1. Construction: E.I.A. standard rack panel per drawing detail.
  2. Connectors: Chassis mount XLR male with gold plated contacts. Chassis mount combo XLR/TRS female latchless version with gold plated contacts.
  3. Color: Black.
  4. Acceptable: Custom by Contractor or comparable by ProCo, Whirlwind.
- S. Mic Patch Cables: For use with mic patchbay.
1. Three conductor.
  2. XLR male to XLR female.

3. Gold plated contacts.
  4. Color: Black.
  5. Provide 1 foot & 2 foot lengths.
  6. Provide with patch cable hanger.
  7. Acceptable: Custom by Contractor or comparable by ProCo, Whirlwind.
  8. Quantity: Eight (8) each.
- T. Bantam-TRS Patch Cables: For patching from line-level audio patchbays to mixing console input on mic patchbay.
1. Three conductor.
  2. Bantam male to 1/4 inch TRS male.
  3. 2 foot length.
  4. Color: Gray.
  5. Provide with patch cable hanger..
  6. Acceptable: Custom by Contractor or comparable by ProCo, Whirlwind.
  7. Quantity: Sixteen (16) each.
- U. Matrix Digital Signal Processor (DSP): Multiple channel digital audio signal processor with matrix routing.
1. Inputs: 4 balanced line level.
  2. Outputs: 8 balanced line level with level adjustable via external control.
  3. Routing: As shown on the Drawings and as specified. Assignable level at each crosspoint, adjustable via external control system.
  4. Signal Processing: As shown on the Drawings. Equalizer to include a minimum 12 filters assignable via software as automatic feedback elimination, high pass, low pass, shelving or parametric; Limiter; Delay.
  5. Recallable presets.
  6. Windows based software for setup.
  7. Rack mounted.
  8. Acceptable: Shure P4800 or comparable by Biamp, Peavey, or Symetrix.
- V. Digital Signal Processor (DSP): Single channel digital audio signal processor.
1. Inputs: 1 balanced line level.
  2. Outputs: 1 balanced line level.
  3. Signal Processing: Equalizer to include a minimum 12 filters assignable via software as automatic feedback elimination, high pass, low pass, shelving or parametric; Limiter; Delay.
  4. Windows based software for setup.
  5. Rack mounted.
  6. Acceptable: Shure DFR11EQ5 or comparable by Biamp, Peavey, or Sabine.
- W. Audio Mixing Console: 32x8x2 Manual audio mixing console.
1. Mono Inputs: 32 balanced mono inputs, mic or line level, phantom power switch, insert, gain control with switchable -20 dB pad, polarity switch, variable high-pass filter, 4-band EQ with 2 swept mids and bypass switch, 8 aux sends switchable in pairs pre or post, pre fader auxs may be switched pre or post EQ, bus routing, mute, PFL, pan, and fader controls on each channel.
  2. Stereo Program Inputs: 2 balanced stereo line inputs, gain control, 4-band EQ with bypass switch, 8 aux sends switchable in pairs pre or post, Bus routing, mute, PFL, pan, and fader controls on each channel.
  3. Stereo Aux Return Inputs: 4 balanced stereo line inputs, gain control, 4 aux sends switchable in pairs to aux send, Bus routing, mute, PFL, pan, and fader controls on each channel.
  4. Outputs: Left, Right, Mono, and 8 groups outputs, each with inserts; 11x2 matrix, 8 aux, record, monitor, and headphone outputs.
  5. Features: PFL/AFL and LED metering on all inputs and outputs; headphone jack with adjustable level; talkback mic/oscillator routable to main, aux, and/or matrix outs; 8 mute groups and 128 MIDI mute snapshot presets with individual channel mute safe override.
  6. Provide with: Rack mounted power supply, Dustcover, Floor Stand, Cardioid Condenser Talkback Mic with 18" gooseneck and 3-pin XLR-M, Two (2) high intensity 18" adjustable work lights with 4-pin right-angle XLR-M.
  7. Acceptable: Soundcraft Series2 console RW5595 with Dustcover, Floor stand, Audiotechnica AT859QMLx, and two (2) Littlelight Mixing Board lights, or comparable by Allen & Heath, Crest, Yamaha.

- X. 70 Volt Attenuator: For Gallery System level control.
1. 75W @70V power handling.
  2. 15dB of attenuation in 1.5dB steps.
  3. Insertion loss less than 0.6dB.
  4. Wall mount in standard 2-gang electrical box.
  5. Terminations via removable terminal block.
  6. Acceptable: Atlas E408-7 or comparable by Altec or Lowell.
- Y. Gallery Plate: For Gallery System inputs.
1. Mounting: Plate for use on standard 2-gang electrical box.
  2. I/O insert plates: stereo audio buffer with RCA inputs and balanced stereo outputs on removable captive screw connectors, XLR female mic input .
  3. Finish: Use manufacturer standard finish coordinated with architect and owner.
  4. Provide with: I/O insert plates.
  5. Acceptable: Extron AAP102 with I/O insert plates or comparable by Inline or Altinex.
- Z. 60W Mixer/Amp: Lobby and gallery system mixer/amplifier.
1. Inputs: balanced mic page input with phantom power, balanced telephone page input, balanced program input.
  2. Outputs: Main speaker level output, balanced Music-on-hold output.
  3. Rated power output: 60 Watts @70 Volt.
  4. Expansion: Module slot configurable for page or background mode.
  5. Features: Manual or auto-muting function with sensitivity control for page override of program/background. Insert jacks for external signal processing.
  6. Provide with: Rack mount kit, volume security knobs, and balanced line input module or chime module as indicated on drawings.
  7. Acceptable: TOA BG-1060 with modules per drawings or comparable by Altec or Biamp.
- AA. 600W/Channel Amplifier: 600W per channel stereo amplifier.
1. Inputs: 2 independent balanced line level.
  2. Outputs: 2 independent speaker level.
  3. Rated power output: 600 Watts per channel (@4 Ohm, 1kHz, 0.5% THD).
  4. Frequency response: 20–20k Hz (+/- 0.5 dB).
  5. Noise: Less than -105dB.
  6. Rack mounted.
  7. Acceptable: Crown CTs-1200 or comparable by Crest or QSC.
- BB. 1500W/Channel Amplifier: 1500W per channel stereo amplifier.
1. Inputs: 2 independent balanced line level.
  2. Outputs: 2 independent speaker level.
  3. Rated power output: 1500 Watts per channel (@4 Ohm, 1kHz, 0.5% THD).
  4. Frequency response: 20–20k Hz (+/- 0.5 dB).
  5. Noise: Less than -105dB.
  6. Rack mounted.
  7. Acceptable: Crown CTs-3000 or comparable by Crest or QSC.
- CC. Control Booth Headphones: Professional headphone monitor to be provided as loose equipment for the control booth..
1. Closed ear headphones.
  2. Frequency response 10-20,000 Hz.
  3. Acceptable: Sony MDR7506 or comparable by Beyer, Sennheiser.
  4. Quantity: One (1)
- DD. Assistive Listening System
1. Assistive Listening Transmitter: Single channel RF assistive listening transmitter.
    - a. Inputs: Balanced line level audio with level control.
    - b. Operating Frequency: 72 MH band, field selectable.
    - c. Compatible with Assistive Listening Receivers specified.
    - d. Provide with: Permanent Mount: Rack mount, remote antenna and mounting hardware, and power supply.

- e. Acceptable: Listen Technologies LT-800-216, LA-107, and LA-309 or comparable by Gentner, Telex or Williams.
  2. Assistive Listening Receiver: Single channel RF assistive listening receiver.
    - a. Operating Frequency: 72MHz band, field selectable.
    - b. Compatible with Assistive Listening Transmitters specified.
    - c. Provide each receiver with ear bud and rechargeable battery set.
    - d. Acceptable: Listen Technologies LR-400-216 with LA-164, LA-166, LA-362 as needed or comparable by Gentner, Telex or Williams.
    - e. Quantity: Twenty (20).
  3. Assistive Listening Receiver Charger: Battery charger for assistive listening receivers specified.
    - a. Compatible with Assistive Listening Receivers specified.
    - b. Acceptable: Listen Technologies LA-311 or comparable by Gentner, Telex or Williams.
    - c. Quantity: Two (2).
- EE. Program Speakers and Subwoofers.
1. Program Speakers:
    - a. Configuration: Bi-amplified (passive MF/HF) 3-way, full range trapezoidal enclosure.
    - b. Drivers: two 12" cone woofers, horn loaded 10" MF, and HF compression driver on a constant directivity horn.
    - c. Dispersion: 90 degree horizontal by 45 degrees vertical (-6 db).
    - d. Frequency response: 50Hz to 18kHz (+/-3 dB).
    - e. Sensitivity: 102 dB SPL (1 Watt at 1 m).
    - f. Impedance: 8 Ohms MF/HF, 4 Ohms LF.
    - g. Power handling: 450 Watts (continuous) MF/HF, 800 Watts (continuous) LF.
    - h. Screw terminal connections.
    - i. Provide with all necessary mounting/rigging hardware.
    - j. Acceptable: EAW AS690e with mounting/rigging hardware or comparable by Community, EV, JBL or Turbosound.
  2. Program Subwoofers:
    - a. Configuration: Vented trapezoidal enclosure.
    - b. Drivers: two 15" cone woofer.
    - c. Frequency response: 57Hz to 500Hz (+/-3 dB).
    - d. Sensitivity: 100 dB SPL (1 Watt at 1 m).
    - e. Impedance: 4 Ohms.
    - f. Power handling: 1200 Watts (continuous).
    - g. Screw terminal connections.
    - h. Provide with all necessary mounting/rigging hardware.
    - i. Acceptable: EAW AS625e with mounting/rigging hardware or comparable by Community, EV, JBL or Turbosound.
- FF. 10" Stage Monitor: Portable powered speaker to be provided as loose equipment.
1. Two way powered speaker (10" woofer).
  2. Multiple line inputs.
  3. Acceptable: JBL EON10 G2 or comparable by EAV, EV, Renkus Heinz.
  4. Quantity: (4) Four
- GG. 15" Stage Monitor: Portable powered speaker to be provided as loose equipment.
1. Two way powered speaker (15" woofer).
  2. Multiple line inputs.
  3. Acceptable: JBL EON15 G2 or comparable by EAV, EV, Renkus Heinz.
  4. Quantity: (2) Two
- HH. Ceiling Speaker: For use in Lobby and Gallery.
1. Configuration: 2-way, full range.
  2. Drivers: 6 inch cone with co-axial 1/2 inch dome tweeter.
  3. Crossovers: passive LP/HP.
  4. Dispersion: 130 degrees by 130 degrees (-6 db).
  5. Frequency response: minimum 80Hz to 20kHz (+/-5 dB).
  6. Sensitivity: minimum 88 dB SPL (1 Watt at 1 m).
  7. Impedance: 8 Ohms nominal.
  8. Power handling: 140 Watts.

9. Color: Coordinate with architect and owner.
10. Provide with: 70 volt transformer with taps at 1, 2, 4, & 8 Watts; speaker grill, backcan, and mounting hardware.
11. Acceptable: Soundolier FA136T87 w/FA720-6 grille and FA97-6 backcan, and necessary transformer or comparable product by Lowell, Altec, Elkay.

**I I. Production Communication System**

1. Production Communication Main Station: 2 Channel Main Station.
  - a. 2 amp power supply.
  - b. Individual volume controls.
  - c. Individual call and talk buttons.
  - d. Individual channel short-circuit protection.
  - e. Visual signaling and adjustable/defeatable audible signaling.
  - f. Program feed to each channel with selectable program interrupt (IFB).
  - g. Built-in speaker.
  - h. 9" Gooseneck Panel Mic.
  - i. Rack mounted.
  - j. Acceptable: Clear-Com MS-232 with Clear-Com GM-9 gooseneck mic or comparable by Telex.
2. Production Communication Speaker Station: Two Channel Speaker Station.
  - a. Channel selector.
  - b. Call and talk buttons.
  - c. Volume control
  - d. Operates with carbon headset, dynamic headset or telephone-style handset.
  - e. Built-in speaker with on/off switch.
  - f. Visual and adjustable/defeatable audible call signaling.
  - g. Mounts in standard 4-gang electrical box.
  - h. Acceptable: Clear-Com KB-211 or comparable by Telex.
3. Production Communication Headset Station: Two Channel Headset Station.
  - a. Channel selector.
  - b. Call and talk buttons.
  - c. Volume control
  - d. Operates with carbon headset, dynamic headset or telephone-style handset.
  - e. Visual and adjustable/defeatable audible call signaling.
  - f. Mounts in standard 2-gang electrical box.
  - g. Acceptable: Clear-Com MR-202 or comparable by Telex.
4. Production Communication Handset: Telephone Style Handset.
  - a. Push-to-talk switch in handle.
  - b. 4-pin female XLR connector compatible with two channel speaker station.
  - c. Mounting cradle included.
  - d. Acceptable: Clear-Com HS-6 or comparable by Telex.
5. Production Communication Beltpack: Two channel beltpack.
  - a. Configuration: Portable, two channel dual listen with monaural output.
  - b. Controls: Call switch, individual channel talk buttons and volume controls.
  - c. Visual call signaling.
  - d. Headset Connection: 4 pin XLR compatible with headsets specified.
  - e. Intercom Connection: 6 pin XLR compatible with Production Communication Power Supply specified. Looping output.
  - f. Construction: All metal with metal belt clip.
  - g. Acceptable: Clear-Com RS-502 or comparable by Telex.
  - h. Quantity: Twelve (12).
6. Production Communication Headset: Single muff headset.
  - a. Configuration: Single muff with integral microphone on adjustable boom arm.
  - b. Headset Connection: 4 pin XLR compatible with beltpacks specified.
  - c. Acceptable: Clear-Com CC-95 or comparable by Beyerdynamic or Telex.
  - d. Quantity: Twelve (12).
7. Intercom wall plate: 6-pin wall plate for belt pack.
  - a. Two channel.
  - b. Acceptable: Clear-Com WP-6 or comparable by Telex.
8. Production Communication Cable, 25': 25' long production communication beltpack cable.
  - a. Cable: 6 conductor with overall shield.

- b. Length: 25'.
  - c. Jacket: Flexible vinyl, rubber or neoprene.
  - d. Terminations: 6 pin XLR compatible with beltpacks specified and wall plates shown on the Drawings.
  - e. Color: Black.
  - f. Acceptable: Clear-Com IC-25 or comparable by Telex, ProCo, Rapco or Whirlwind.
  - h. Quantity: Eight (8).
9. Production Communication Cable, 50': 50' long production communication beltpack cable.
- a. Cable: 6 conductor with overall shield.
  - b. Length: 50'.
  - c. Jacket: Flexible vinyl, rubber or neoprene.
  - d. Terminations: 6 pin XLR compatible with beltpacks specified and wall plates shown on the Drawings.
  - e. Color: Black.
  - f. Acceptable: Clear-Com IC-50 or comparable by Telex, ProCo, Rapco or Whirlwind.
  - g. Quantity: Eight (8).

### 2.3. VIDEO PRODUCTS

- A. Computer Interface and I/O Panel: For use in downstage left and right floor boxes.
- 1. Inputs: (1) computer inputs on HD15-F, (1) input with stereo audio on 3.5mm phone jack.
  - 2. Outputs: RGBHV on (5) BNC connectors, balanced stereo audio on removable captive screw connectors, buffered local monitor output on HD15-F.
  - 3. Compatible formats: VGA, SVGA, XGA, SXGA, UXGA.
  - 4. Bandwidth: 300 MHz.
  - 5. Functions: Serration pulse removal.
  - 6. Additional Features: Horizontal position adjustment on front panel.
  - 7. I/O insert plates: composite video on BNC, stereo audio buffer with RCA inputs and balanced stereo outputs on removable captive screw connectors, touch panel control net on connector compatible with control system.
  - 8. Finish: Use manufacturer standard finish coordinated with architect and owner.
  - 9. Provide with: I/O insert plates, (1) 12 foot VGA/audio cable and, (1) 12 foot VGA cables.
  - 10. Acceptable: Extron RGB 468Mxi or comparable by Inline or Altinex.
- B. S-VHS Video Cassette Recorder (VCR):
- 1. Inputs: Unbalanced stereo line level audio, S-video.
  - 2. Outputs: Unbalanced stereo line level audio, S-video.
  - 3. Compatible formats: Record in SP or EP mode, playback in SP or EP mode.
  - 4. Control: IR control compatible with control system specified.
  - 5. Provide with: Rack mounting kit.
  - 6. Acceptable: JVC SR-V10U with rack mount kit or comparable by Aiwa, Panasonic, Sony or Toshiba.
- C. DVD Player:
- 1. Outputs: S-video and stereo audio.
  - 2. Compatible formats: CD, CD-R, CD-RW, Video CD, DVD-R, DVD-RW.
  - 3. Control: Bidirectional serial control compatible with control system specified.
  - 4. Rack mounted.
  - 5. Acceptable: Marantz DV7110P or comparable by Panasonic, Pioneer, Sony or Toshiba.
- D. Video Projector: High brightness video and graphics projector.
- 1. Three LCD imaging system.
  - 2. Minimum 1.3" TFT polysilicon LCD panels.
  - 3. Resolution: 1024x768 (XGA) native, 1600x1200 (UXGA) compatible.
  - 4. Brightness: 5000 ANSI lumens, dual lamp operation.
  - 5. Contrast Ratio: 700:1 (full on/full off).
  - 6. Uniformity: 90% (corner-to-corner).
  - 7. Electronic digital keystone correction.
  - 8. Power horizontal and vertical lens shift.
  - 9. Power zoom lens.
  - 10. Control: Bi-directional serial control.
  - 11. Noise: =45dB.

12. Dual lamp with selectable dual or single lamp operation.
13. Inputs: Direct selectable, independent inputs including RGBHV, S-Video, composite video, and component (YUV) video.
14. HDTV compatible including 480i, 480p, 720p and 1080i.
15. 110VAC operation.
16. Provide with "semi-long throw" zoom lens (coordinate lens with field conditions) and two (2) spare lamps.
17. Acceptable: NEC GT5000, Sanyo PLC-XFXF30NL, Sanyo PLC-XF31NL or Barco iQ G500.

#### 2.4. ROUTING AND SWITCHING PRODUCTS

- A. Switcher/Scaler: Multi-format video and stereo audio switcher with built-in scaler.
1. Inputs: (6) configurable for composite, S-video, component, or RGBHV video on BNC connectors with balanced/unbalanced stereo line level audio on screw terminal connectors.
  2. Outputs: (1) Scaled video output simultaneously on 15-pin HD connector and five BNC connectors with balanced stereo line level audio on screw terminal connectors.
  3. Video Bandwidth: 350MHz (-3 dB).
  4. Video Output Resolution: 640 x 480 – 1365 x 1024, HDTV 480P/ 720P/1080P/1080I.
  5. Audio processing: Audio gain control for each individual input and the main output.
  6. Control: Direct front panel and bidirectional serial control compatible with control system specified.
  7. Rack mounted.
  8. Acceptable: Extron System 7SC or comparable by Autopatch, FSR, or Inline.

#### 2.5. CONTROL PRODUCTS

- A. Control Processor: Integrated, programmable control processor.
1. Inputs: 1 control system network, 1 programming port, other inputs as shown on the Drawings.
  2. Outputs: 3 bidirectional serial ports for RS-232/422/485, 8 infrared or serial ports, 8 analog and digital input output ports, 8 isolated normally open relay closures, and 3 ports for control system expansion cards.
  3. One 10/100 BaseT Ethernet port, TCP/IP and UDP/IP protocols
  4. System expandability: Connectivity to additional card cages and processors.
  5. Programming: Windows based software.
  6. Memory: 36MB of internal memory, expandable to 4GB.
  7. Rack mounted.
  8. Provide with: Power supply, all necessary interface cables.
  9. Acceptable: Crestron CP2E or comparable by AMX
- B. Touchpanel:
1. Display: 5.7" touch-sensitive active matrix color LCD.
  2. Resolution: 320 X 240 pixels.
  3. Color depth: 16-bit.
  4. Engravable hardware pushbuttons.
  5. Acceptable: Crestron TPS-1700 or comparable by AMX.
- C. Control Net Block:
1. Inputs/Outputs: 10 network connections.
  2. Provide with: Power supply as necessary.
  3. Acceptable: Crestron CNHBLOCK or comparable by AMX or Xantech.
- D. Control System Power Sensors: Unless shown otherwise, in all systems with integrated control systems a Power Sensor, LED Sensor or Video Sync Sensor shall be provided for any equipment without positive power status feedback to the control system. This includes all source equipment, interfaces, display devices, routing equipment, etc. Equipment that is not user accessible or with no user accessible power control and that incorporates latching power operation is exempt from this requirement. Positive power status feedback shall be determined by confirmation of the power status of a device through bi-directional serial communication or by low-level logic or contact closure verification to the control system.
1. AC Power Sensor: For devices with no inherent or continuous video sync output.
    - a. Inputs: 1 AC power input on 3 prong socket connector rated to 10 amps, 1 control system

- network.
  - b. Outputs: 1 AC power output on 3 prong connector rated to 10 amps, 1 control system network.
  - c. Control: Current sensing for full and partial power to either control system network or contact closures.
  - d. Provide with: Power supply.
  - e. Acceptable: Crestron CNCS, Crestron ST-CS or comparable by AMX.
2. Video Sync Sensor: For devices that produce a continuous video sync output whenever active. Dual channel devices may be used to provide two channels of sensing.
- a. Inputs: 1 composite video.
  - b. Outputs: 1 composite video.
  - c. Control: Video sync sensing of input to either control system network or contact closures.
  - d. Provide with: Power supply.
  - e. Acceptable: Crestron ST-VS or comparable by AMX.
- E. Control System Programming:
1. General Programming:
- a. The control system should provide user-friendly and intuitive control of all normal audiovisual system functions.
  - b. A meeting with the Owner should take place a minimum of 30 calendar days before substantial completion to coordinate and verify specific programming requirements and direction.
  - c. Contractor to supply Owner with programmed Touch Panel and Control System Processor a minimum of 14 calendar days before substantial completion for review and comment. Allow 3 to 7 days for review.
  - d. Contractor shall provide one programming revision of the control system 30 to 60 days after initial use by the Owner. This reprogramming effort should not exceed 4 hours. The intent of this reprogramming is to accommodate minor changes desired by the Owner after use of the system, such as labeling or colors of buttons, timing related to automated sequences, etc.
  - e. Coordinate all programming functionality with the Owner and Owner's Representative. Preliminary discussions have identified the following requirements:
    - 1) The control system needs to be able to support audiovisual system operation for an untrained user for presentations. Requirements for presentations include basic source selection for the projection system, transport control, and volume control functions.
  - f. Software used in programming shall be control system manufacturer's latest software.
2. System Programming: Programming to be based on, but not limited by, the Contract Documents and meetings with the Owner's Representative and information listed. Control system to provide, but is not limited to, the following:
- a. Power up and down sequencing.
  - b. Transport controls of all source gear including but not limited to:
    - 1) DVD: Play, pause, stop, skip forward, skip backward, scan forward, scan backward, up, down, left, right, menu, enter.
    - 2) VCR: Play, pause, stop, fast forward, rewind, scan forward, scan backward.
  - c. Projector/display Control: On, off, picture mute, input selection.
  - d. Routers and Switchers: All routing functions including breakaway audio/video.
  - e. Volume Control: Volume control of the stereo program audio from Switcher/Scaler.
  - f. Feedback: All serial control should be RS-422 where available and RS-232 where RS-422 is not available. All serial control devices should have latching feedback. All devices without bidirectional control or tally feedback should have momentary feedback.
3. Control System Graphical Interface (Touch Panel) Programming: Interface to be based on, but not limited by, the Contract Documents and meetings with the Owner and Owner's Representative. Graphical Interface should incorporate, but is not limited to, the following:
- a. Logo screen: Owner's logo. This screen should also be displayed for a minimum of 1 minute after system power down.
  - b. Power up verification screen: Allow user to turn on system via password access or return to Logo screen.
  - c. Power up and down screen: Timed to allow system time to power up or down. Provide visual feedback of progress.
  - d. Main control screen: Primary User screen. Shall provide primary system operation without requiring page flips or other screens. The use of pop-up pages, sub pages and variable text are recommended to help direct the user and minimize confusion and clutter. This screen should contain or have direct access to the following:

- 1) Source Selection: Selection of available sources for display.
- 2) Projector: Power on, power off, picture mute and set-up.
- 3) Volume Control: Up, down, mute. Stereo program volume.
- 4) Power down: Takes user to the power down verification screen.
- 5) Help button: Provides directions on basic system operation and touch panel functionality.
- 6) Setup: A hidden button with password to allow basic touch panel setup by a trained operator.
- 7) Clock.
- e. Transport control sub pages including, but not limited to:
  - 1) DVD: Play, pause, stop, skip forward, skip backward, scan forward, scan backward, up, down, left, right, menu, enter.
  - 2) VCR: Play, pause, stop, fast forward, rewind, scan forward, scan backward.
- f. Power down verification page: Permit User to proceed to power down screen or return to main control screen.
- g. Touch Panel to incorporate Owner's Logo and color scheme.
- h. All buttons should have a clearly contrasting color from the background.
- i. The feedback for all buttons should incorporate a color change to a clearly contrasting color from the off state and background.
- j. All text should be clear and contrast buttons and/or background color and should define systems and equipment in a User friendly manner.
- k. All serial controlled devices should be provided with latching feedback. All non serial devices should be provided with momentary feedback.
- l. Acceptable: Custom by Manufacture's Certified Contractor.

## 2.6. MISCELLANEOUS PRODUCTS

- A. 70" Equipment Rack: For use as Main Audio Rack in Sound Control Booth.
  1. Construction: Welded steel. Front rack rails on standard EIA 19" spacing
  2. Size: 40 rack spaces (70") usable height, 25" deep.
  3. Finish: Black powder coat.
  4. Provide each rack with:
    - a. Removable, vented and locking back door
    - b. Top closure panel as required.
    - c. Rack work light.
    - d. Rear rack rail pair.
    - e. Copper bus bar.
  5. Acceptable: Middle Atlantic ERK4025 or comparable Atlas or Lowell.
- B. 61.25" Equipment Rack: For use as Mixing Console Rack in Sound Control Booth.
  1. Construction: Welded steel. Front rack rails on standard EIA 19" spacing
  2. Size: 35 rack spaces (61.25") usable height, 25" deep.
  3. Finish: Black powder coat.
  4. Provide each rack with:
    - a. Removable, vented and locking back door
    - b. Removable, vented and locking front door
    - c. Top closure panel as required.
    - d. Rack work light.
    - e. Rear rack rail pair.
    - f. Copper bus bar.
  5. Acceptable: Middle Atlantic ERK3525 or comparable Atlas or Lowell.
- C. Wall Mount Equipment Rack: For use as Stage Manager's Rack off stage left.
  1. Construction: Welded steel. Hinged locking center section. Front rack rails on standard EIA 19" spacing. Reversible swing on center section and front door.
  2. Size: 24 rack spaces (42") usable height, 17" deep center section.
  3. Finish: Black powder coat.
  4. Provide each rack with:
    - a. Locking front door
    - b. Rack work light.
    - c. Copper bus bar.
  5. Acceptable: Middle Atlantic DWR-24-17 with FD-24 or comparable Atlas or Lowell.

- D. Wall Mount Equipment Rack: For use as Video System Rack
1. Construction: Welded steel. Hinged locking center section. Front rack rails on standard EIA 19" spacing. Reversible swing on center section and front door.
  2. Size: 18 rack spaces (31.5") usable height, 17" deep center section.
  3. Finish: Black powder coat.
  4. Provide each rack with:
    - a. Locking front door
    - b. Rack work light.
    - c. Copper bus bar.
  5. Acceptable: Middle Atlantic DWR-16-17 with FD-16 or comparable Atlas or Lowell.
- E. Rack Work Light:
1. Functions: 2 settings, magnetic attachment.
  2. Provide with: Power supply.
  3. Acceptable: Elkay RL-1 or comparable by Atlas/Sound, Stantron or Middle Atlantic.
- F. Copper Bus Bar:
1. Construction: Copper.
  2. Size: As specified with rack.
  3. Acceptable: Middle Atlantic BB Series, or comparable by Atlas/Sound, Stantron.
- G. Equipment Rack Blank Panels:
1. Construction: Brushed, anodized aluminum. 11 gage construction
  2. Size: To be determined by drawings.
  3. Acceptable: Middle Atlantic HBL Series, or comparable by Atlas/Sound, Stantron.
- H. Equipment Rack Vent Panels:
1. Construction: 16 gage steel perforated with 5/32" perforated holes providing 68% open area.
  2. Size: To be determined by drawings.
  3. Acceptable: Middle Atlantic VT Series, or comparable by Atlas/Sound, Stantron.
- I. Power Sequencer/Conditioner:
1. Input: AC power input on 9 foot 3-wire #12 line cord.
  2. Output: 3 sequenced groups each with dual duplex AC receptacles rated at 20 amps. 1 duplex output always on.
  3. Limiters: Series surge reactor current limiter, Cascaded auto-tracking dual polarity voltage limiter, Dual pulse inverters.
  4. Rating: UL-1449-2 Listed and meets 1996 U.S. Government Grade A, Class 1, Mode 1 Guidelines for power line surge suppression.
  5. Filter: Bi-directional, wave tracking, 3dB @3KHz, 38dB @100KHz, 50dB @30MHz.
  6. Maximum Surge Pulse Joule Rating: Unlimited, due to surge current limiting.
  7. Maximum Surge Pulse Voltage: 6,000 volts (1.2 x 50 microseconds).
  8. Maximum Surge Pulse Current: 100,000 amps (8 x 20 microseconds).
  9. Sequencing: Adjustable delay from 0 to 40 seconds.
  10. Control: Contact closure or control voltage inputs and outputs.
  11. Rack mounted.
  12. Acceptable: SurgeX SX2120 SEQ.
- J. Power Controller/Conditioner:
1. Input: AC power input on 9 foot 3-wire #12 line cord.
  2. Output: 3 switched duplex AC receptacles rated at 20 amps. 1 duplex output always on.
  3. Limiters: Series surge reactor current limiter, Cascaded auto-tracking dual polarity voltage limiter, Dual pulse inverters.
  4. Rating: UL-1449-2 Listed and meets 1996 U.S. Government Grade A, Class 1, Mode 1 Guidelines for power line surge suppression.
  5. Filter: Bi-directional, wave tracking, 3dB @3KHz, 38dB @100KHz, 50dB @30MHz.
  6. Maximum Surge Pulse Joule Rating: Unlimited, due to surge current limiting.
  7. Maximum Surge Pulse Voltage: 6,000 volts (1.2 x 50 microseconds).
  8. Maximum Surge Pulse Current: 100,000 amps (8 x 20 microseconds).
  9. Control: Remote turn-on via contact closure or control voltage inputs and outputs.
  10. Rack mounted.

11. Acceptable: SurgeX SX1120RT.
- K. Power Conditioner: For use with room mounted devices (video projectors, etc.) that have power controlled via the control system.
1. Input: AC power input on 9 foot 3-wire #14 line cord.
  2. Output: 1 switched duplex AC receptacle rated at 15 amps.
  3. Limiters: Series surge reactor current limiter, Cascaded auto-tracking dual polarity voltage limiter, Dual pulse inverters.
  4. Rating: UL-1449-2 Listed and meets 1996 U.S. Government Grade A, Class 1, Mode 1 Guidelines for power line surge suppression.
  5. Filter: Bi-directional, wave tracking, 3dB @3KHz, 38dB @100KHz, 50dB @30MHz.
  6. Maximum Surge Pulse Joule Rating: Unlimited, due to surge current limiting.
  7. Maximum Surge Pulse Voltage: 6,000 volts (1.2 x 50 microseconds).
  8. Maximum Surge Pulse Current: 100,000 amps (8 x 20 microseconds).
  9. Surface mounted. Acceptable: SurgeX SX15 IR2.
- L. Electrical/Electronic Termination Blocks:
1. Use: for centralized, cross-connect termination and distribution of all line level audio cabling and low voltage control cabling.
  2. Construction: 1x8 blocks of Punch-down type connectors. Shield terminations to be floating unless otherwise indicated on drawings.
  3. Exceptions: Termination blocks are not required for circuits that terminate at ADC patch bays with QCP IV terminals.
  4. Acceptable: ADC I.C.O.N. System with QCP IV type terminals (shield terminations floating). Provide identification strips as required. (Telco 66-type punch blocks are not acceptable.)
- M. Barrier Strips: For termination of large gauge wire.
1. Use: for centralized, cross-connect termination and distribution of all speaker level audio cabling and other large gauge cabling.
  2. Acceptable: Entrelec and Phoenix Contact are considered acceptable.
- N. Floor, Wall and Rack Mounted Device Plates:
1. Construction: As indicted on drawings, custom metal or standard NEMA plates or EIA 19" panels.
  2. Text: Engraved text & graphics with minimum text size of 1/8 inch.
  3. Color: Coordinate with Owner/Architect.
  4. Acceptable: ProCo Plateworks/Captain NEMA or comparable product by RCI, custom by Contractor.
- O. Connectors (male/female, chassis/inline): Standard XLR (3 Pin, 4 Pin, 5 Pin), standard TRS ¼" phone, combination XLR/TRS, insulated RCA, proprietary Neutrik "Speakon" (2 circuit).
1. Acceptable: Canare, Kings, Switchcraft, Neutrik or ITT/Cannon.
- P. Line Level Audio and Microphone Cable, Plenum Rated:
1. Use: Line level and microphone audio cable in racks, conduit and plenum spaces.
  2. Construction: 22AWG twisted pair conductors, 24 AWG drain wire, flexible plenum jacket.
  3. Rating: UL and Plenum rated.
  4. Acceptable: West Penn 25291 or comparable by Belden or Gepco.
- Q. Line Level Audio and Microphone Cable:
1. Use: Line level and microphone audio cable in racks and conduit.
  2. Construction: 22AWG twisted pair conductors, 24 AWG drain wire, flexible jacket.
  3. Rating: UL rated.
  4. Acceptable: West Penn 291 or comparable by Belden or Gepco.
- R. Speaker Cable, Distributed, Plenum Rated:
1. Use: Distributed speaker cable in racks, conduit and plenum spaces.
  2. Construction: 16AWG unshielded twisted pair conductors with flexible plenum jacket.
  3. Rating: UL and Plenum rated.
  4. Acceptable: West Penn 25225B or comparable by Belden or Gepco.
- S. Speaker Cable, Distributed:

1. Use: Distributed speaker cable in racks and conduit.
  2. Construction: 16AWG unshielded twisted pair conductors with flexible jacket
  3. Rating: UL rated.
  4. Acceptable: West Penn 225 or comparable by Belden or Gepco.
- T. Speaker Cable, Program, Plenum Rated:
1. Use: Program speaker cable in racks, conduit and plenum spaces.
  2. Construction: 12AWG unshielded twisted pair conductors with flexible plenum jacket.
  3. Rating: UL and Plenum rated.
  4. Acceptable: West Penn 25227B or comparable by Belden or Gepco.
- U. Speaker Cable, Program:
1. Use: Program speaker cable in racks and conduit.
  2. Construction: 12AWG twisted pair conductors with flexible jacket.
  3. Rating: UL rated.
  4. Acceptable: West Penn 227 or comparable by Belden or Gepco.
- V. Control Cable, Contact Closure:
1. Use: Control cable for contact closures in racks and conduit.
  2. Construction: 22AWG unshielded multiple twisted pair conductors flexible jacket.
  3. Rating: UL rated.
  4. Acceptable: West Penn 3241 or 3271 or comparable by Belden or Gepco.
- W. Control Cable, Contact Closure, Plenum Rated:
1. Use: Control cable for contact closures in racks, conduit and plenum spaces.
  2. Construction: 22AWG unshielded multiple twisted pair conductors flexible plenum jacket.
  3. Rating: Plenum and UL rated.
  4. Acceptable: West Penn 253241 and 253271 or comparable by Belden or Gepco.
- X. Control Cable, Serial Communication:
1. Use: Control cable for serial communication in racks and conduit.
  2. Construction: Two or three twisted pair 24AWG stranded conductors and 26AWG drain wire with flexible jacket.
  3. Rating: UL rated.
  4. Acceptable: West Penn D2402 or D2403 or comparable by Belden or Gepco.
- Y. Control Cable, Serial Communication, Plenum Rated:
1. Use: control cable for serial communication in racks, conduit and plenum spaces.
  2. Construction: Two or three twisted pair 24AWG stranded conductors and 26AWG drain wire with flexible plenum jacket.
  3. Rating: Plenum UL rated.
  4. Acceptable: West Penn D252402 or D252403 or comparable by Belden or Gepco.
- Z. Control Cable, Network Communication:
1. Use: Control cable for network communication in racks and conduit.
  2. Construction: Two twisted pair, one shielded pair 22AWG stranded conductors and 24AWG drain wire, one unshielded pair 18AWG stranded conductors, all with flexible jacket.
  3. Rating: UL rated.
  4. Acceptable: Liberty Cresnet PVC or comparable by West Penn, Belden or Gepco.
- AA. Control Cable, Network Communication, Plenum Rated:
1. Use: Control cable for network communication in racks and conduit.
  2. Construction: Two twisted pair, one shielded pair 22AWG stranded conductors and 24AWG drain wire, one unshielded pair 18AWG stranded conductors, all with flexible plenum jacket.
  3. Rating: UL rated.
  4. Acceptable: Liberty Cresnet Plenum or comparable by West Penn, Belden or Gepco.
- BB. DC Power Cable:
1. Use: DC power in racks and conduit.
  2. Construction: Unshielded twisted pair 18AWG stranded conductors with flexible jacket.

3. Rating: UL rated.
4. Acceptable: West Penn Wire 224 or comparable by Belden, Gepco.

**CC. DC Power Cable, Plenum Rated:**

1. Use: DC power in racks, conduit and plenum spaces.
2. Construction: Unshielded twisted pair 18AWG stranded conductors with flexible plenum jacket.
3. Rating: Plenum and UL rated.
4. Acceptable: West Penn Wire 25224 or comparable by Belden, Gepco.

**DD. Video Cable, Plenum Rated:**

1. Use: video cable for composite, S-video, component video in racks, conduit and plenum spaces.
2. Construction: RG-59 coax cable with FEP Teflon insulation, tinned copper double braided shield, 20AWG solid copper conductor with flexible plenum jacket.
3. Rating: Plenum and UL rated.
4. Acceptable: Belden 88281 or comparable by West Penn Wire, Gepco.

**EE. Video Cable:**

1. Use: Video cable for composite, S-video, component video in racks and conduits.
2. Construction: RG-59 coax cable with Polyethylene insulation, tinned copper double braided shield, 22AWG solid copper conductor with flexible jacket.
3. Rating: UL rated.
4. Acceptable: Belden 8281 or comparable by West Penn Wire, Gepco.

**FF. Video Cable, Inside Racks:**

1. Use: Video cable for composite, S-video, component video in racks.
2. Construction: RG-59 coax cable with Polyethylene insulation, tinned copper double braided shield, 23AWG solid copper conductor with flexible jacket.
3. Rating: UL rated.
4. Acceptable: Belden 9209 or comparable by West Penn Wire, Gepco.

**GG. RGBHV Cable, Short Runs, Plenum Rated:**

1. Use: RGBHV cable for runs less than 50 feet in total length inside conduit, equipment racks and plenum spaces.
2. Construction: 5 conductor RG-59 coax cable with Polyethylene insulation, tinned copper double braided shield, 26AWG copper conductor with flexible jacket.
3. Attenuation: Maximum 5.37dB at 100 MHz over 100 feet.
4. Rating: Plenum and UL rated.
5. Acceptable: Extron BNC-5 Mini HR Cable Plenum Rated or comparable by West Penn or Belden.

**HH. RGBHV Cable, Long Runs, Plenum Rated:**

1. Use: RGBHV cable for run of 50 feet or more in total length inside conduit and equipment racks.
2. Construction: 5 conductor RG-59 coax cable with Foam Teflon insulation with copper double braided shield, 22AWG copper conductor with flexible jacket.
3. Attenuation: Maximum 3dB at 100 MHz at 100 feet.
4. Size: maximum outer diameter 0.6 inches.
5. Rating: Plenum and UL rated.
6. Acceptable: Belden 1826a or comparable by West Penn or Inline.

**I I. RGBHV Cable, short runs:**

1. Use: RGBHV cable for runs less than 50 feet in total length inside conduit and equipment racks.
2. Construction: RG-59 coax cable with Polyethylene insulation, tinned copper double braided shield, 26AWG tinned copper conductor with flexible jacket.
3. Attenuation: Maximum 9.6dB at 300 MHz at 100 feet.
4. Rating: UL rated.
5. Acceptable: Covid CVD 1500 or comparable by Extron or Inline.

**JJ. RGBHV Cable, Long Runs:**

1. Use: RGBHV cable for run of 50 feet or more in total length inside conduit and equipment racks.
2. Construction: 5 conductor RG-59 coax cable with copper double braided shield, 24AWG copper conductor with flexible jacket.
3. Attenuation: Maximum 4dB at 100 MHz at 100 feet.

4. Rating: UL rated.
5. Acceptable: Extron BNC-5 or comparable by Belden or Inline.

**KK. RGBHV Cable, High Resolution, Long Runs:**

1. Use: RGBHV cable for 50 feet or more in total length inside conduit and equipment racks.
2. Construction: 5 conductor RG-59 coax cable with Polyethylene insulation, tinned copper double braided shield, 18AWG copper conductor with flexible jacket.
3. Attenuation: maximum 3.5dB at 270 MHz over 100 feet.
4. Rating: UL rated.
5. Acceptable: Canare V5-5CFB or comparable by Extron or Inline.

**LL. Multimedia Install Cable, Plenum Rated:**

1. Use: Plenum rated bundled cable for connections to wall plates, computer interfaces and similar devices. May be used in place of individual Video, RGBHV Precision Video, Line and Microphone Level Audio, DC Power and Contact Closure Control Cables for runs under 50' in total length and between devices within a single equipment rack or an equipment rack group.
2. Construction: 5 conductor RG-59 coax cable with copper double braided shield, 26AWG copper conductor with flexible jacket; three twisted pair shielded conduction, each with drain wire and overall jacket with 26AWG stranded conductor; two single conductor unshielded cables with 20 AWG stranded conductors; all with overall flexible plenum jacket.
3. Attenuation: RG-59 maximum 8dB at 200 MHz at 100 feet.
4. Size: Maximum outer diameter of 0.62 inches.
5. Rating: Plenum and UL rated.
6. Acceptable: Extron 17 Conductor Install or Inline IN8800.

**MM. Multimedia Install Cable:**

1. Use: Bundled cable for connections to wall plates, computer interfaces and similar devices. May be used in place of individual Video, RGBHV Precision Video, Line and Microphone Level Audio, DC Power and Contact Closure Control Cables for runs under 50' in total length and between devices within a single equipment rack or an equipment rack group.
2. Construction: 5 conductor RG-59 coax cable with copper double braided shield, 26AWG copper conductor with flexible jacket; three twisted pair shielded conduction, each with drain wire and overall jacket with 26AWG stranded conductor; two single conductor unshielded cables with 20 AWG stranded conductors; all with overall flexible jacket.
3. Attenuation: RG-59 maximum 8dB at 200 MHz at 100 feet.
4. Size: Maximum outer diameter of 0.62 inches.
5. Rating: Plenum and UL rated.
6. Acceptable: Extron 14 Conductor Install or Inline IN8800.

**NN. Antenna Extension Cable:**

1. Use: For wireless microphone, wireless control and assistive listening RF systems in conduit and racks less than 200 feet.
2. Construction: RG-58 A/U type 50ohm coaxial cable.
3. Rating: UL rated.
4. Acceptable: Belden 8219 or comparable by West Penn Wire, Gepco.

**OO. CATV Cable, Plenum Rated:**

1. Use: For broadband RF distribution cabling in rack, conduit and plenum spaces.
2. Construction: RG-6 coaxial cable.
3. Rating: Plenum and UL rated.
4. Acceptable: Belden 89248 or comparable by West Penn Wire, Gepco.

**PP. CATV Cable:**

1. Use: For broadband RF distribution cabling in rack, conduit and plenum spaces.
2. Construction: RG-6 coaxial cable.
3. Rating: UL rated.
4. Acceptable: Belden 9248 or comparable by West Penn Wire, Gepco.

**QQ. Telephone Cable:**

1. Use: For use in extending telephone set cabling in rack and conduit.

2. Construction: Four 24AWG conductors in a flat jacket.
3. Rating: UL rated.
4. Acceptable: Belden, West Penn Wire, Gepco or comparable.

**RR. Category 5 Cable, Plenum Rated:**

1. Use: For use in data cabling in racks, conduit and plenum spaces.
2. Construction: 4 shielded twisted pairs, 24 AWG. Meets IEEE 802.3 and 802.5.
3. Rating: Plenum and UL rated.
4. Acceptable: West Penn WP55082 or comparable by Belden or Lucent.

**SS. Category 5 Cable:**

1. Use: For use in data cabling in equipment racks and conduit.
2. Construction: 4 shielded twisted pairs, 24 AWG. Meets IEEE 802.3 and 802.5.
3. Rating: UL rated.
4. Acceptable: West Penn WP54783 or comparable by Belden, Lucent.

### **PART 3 EXECUTION**

#### **3.01 PREPARATION**

- A. Verify compliance of installation, location, quantity, size and access to the following items before beginning installation
1. AC power circuits for equipment racks and systems.
  2. Isolated ground AC power circuits for equipment racks and systems.
  3. Junction boxes, floor boxes, wall boxes, wire troughs, conduit stubs and other related infrastructure for the systems.
  4. System devices supplied to others for installation.
  5. Owner Furnished Equipment or equipment supplied by others as defined in the Contract Documents.
  6. Overhead supports or rigging hardware provided and installed by others for system devices.
  7. Millwork, cabinetry and Architectural elements directly related to the systems such as speaker enclosures, user equipment racks and camera enclosures.
- B. Immediately notify the Owner or Owner's Representative in writing of any discrepancies.

#### **3.02 CUTTING & PATCHING**

- A. Contractor shall coordinate all cutting, fitting, or patching of work that may be required to make the several parts of the work come together properly and fit it to receive or to be received by other portions of his own work or that of subcontractors or installing material men as shown or reasonably implied by Contract Documents for completed structure. Also, make or have made proper and sufficient repair or closure as Owner's Representative may direct.
- B. Do not endanger any work by cutting, digging, etc., and do not cut or alter work of any Section without prior consent of Owner's Representative.

#### **3.03 INSTALLATION**

**A. General**

1. Execute work in accordance with Paragraph 1.2, local and State codes, ordinances and regulations.
2. Install equipment according to manufacturers' recommendations
  - a. Properly match levels and impedance between components.
  - b. Do not install equipment in a manner different than indicated. Contractor shall obtain written approval from the Owner for any variances.
  - c. Provide brackets, screws, adapters, springs, rack mounting kits, etc, recommended by manufacturer for correct assembly and installation of speaker assemblies and electronic components.
3. Finishes for exposed or custom fabricated components shall be approved by the Owner's Representative.
4. Enclose electrical and electronic equipment in metal raceways rigidly secured plumb and square to

- the building.
5. Locate overhead (distributed) loudspeakers as shown on the drawings, with minor changes not to exceed 6 inches in any direction.
    - a. Confirm polarity of speaker before installation and wire to maintain uniform polarity.
    - b. If not mounted by the manufacturer, mount transformers with screws securely to speaker brackets or enclosures. Adjust torsion springs as necessary to securely support speaker assembly.
    - c. Loosely but completely fill speaker back boxes that do not have fiberglass installed with specified fiberglass.
    - d. Seal cone speakers to enclosures so air will not pass from one side of speaker to other.
  6. Locate and aim package speaker systems or speaker clusters as shown on the Drawings, with minor changes not to exceed 3" or 0.5° respectively in any direction for the entire cluster. Within any given cluster, the alignment of individual cabinets in relationship to one another is not to vary by more than 1/8" or .025° from the drawings. Additional adjustments may be required during any Substantial Completion Tests and Adjustments or Final Tests (Paragraph 3.6 and 3.7).
  7. Design and install supports, mounts, attachments, attachment points and hardware reinforcement requirements in accordance with Paragraph 1.2 and industry standards. Verify capacity of mounting methods used in the work.
    - a. Do not impose the weight of equipment or fixtures on supports provided for other trades or systems.
    - b. Do not fabricate or install supports that would overload the building structure. Do not drill or cut concrete beams, joists or structural steel, and do not weld to structural steel, except as specifically authorized in writing by the Owner or designated representative.
    - c. Use attachment and support hardware with a minimum safety factor of 5:1 for static loads, and 8:1 for dynamic loads.
    - d. For any equipment that is to be suspended, the equipment and all associated attachment and support hardware is to be certified by the manufacturer(s) for the use and application intended.
    - e. At the Contractor's expense, a registered structural engineer shall approve and stamp drawings for supports and mounts for any equipment to be suspended.

#### B. Equipment Racks

1. Verify depth of cabinet before assembly to ensure mounted equipment will fit completely inside with doors closed.
2. Fill unused equipment mounting spaces with blank panels or vent panels.
3. Assure sufficient ventilation space between equipment for adequate cooling.
4. Follow amplifier manufacturer's recommendations regarding ventilation space between amplifiers.
5. Distribution of electrical power within the equipment rack
  - a. Provide a minimum of one spare AC receptacle for each four in use per branch circuit, with a minimum of one.
  - b. Do not share power amplifier branch circuits with any line level devices.
  - c. Clearly label receptacles in the rack for panel and circuit breaker number.
  - d. Provide switched receptacles as required to meet the power sequencing as defined in the Contract Documents.
6. Use EMT or flexible conduits (per NEC) and PVC fittings to provide insulated connections of the electrical raceway systems to equipment racks.
7. Provide continuous raceways with no more than 40% fill, between wire troughs and equipment rack for all non-plenum-rated cables. Combine circuits only as allowed in Paragraph 3.3.C.8.
8. Plenum rated cable may be routed into the equipment racks via EMT stubs into the above-ceiling area. Combine circuits only as allowed in Paragraph 3.3.C.8.

#### C. Wiring Practices

1. Perform wiring in accordance with the references in Paragraph 1.5.
2. Do not pull wire or cable through any box fitting or enclosure where change of raceway alignment or direction occurs. Do not bend conductors to less than recommended radius. Employ temporary guides, sheaves, rollers and other necessary items to protect cables from excess tension, abrasion or damaging bending during installation.
3. Provide wire pulling lubricants and pulling tensions in accordance with the wire and cable manufacturers' recommendations.
4. Use grommets around cut-outs and knock-outs where conduit or chase nipples are not installed.
5. Do not use double-stick tape or sticky-back cable anchors.

6. Terminate field wiring entering an equipment rack as follows
  - a. Provide ample service loop for each cable that breaks out from a harness. Provide ample service loops at plates, panels and equipment for de-mounting, service and inspection.
  - b. Do not splice wire inside the equipment rack under any circumstance.
  - c. Connect line level wiring only to accepted terminal barrier strips, solder terminal blocks (x-mas trees) or standard telco 66-type punch blocks are not acceptable. Connect speaker level wiring only to accepted terminal barrier strips. Do not parallel or branch cables and lines at other points.
  - d. Mount terminal strips on 3/4 inch plywood or 1/8 inch thick aluminum plates/blank panels; mounting on the bottom of the rack will not be acceptable. Provide 15% spare terminals at each location.
  - e. Employ permanent strain relief's for any cables whose outside diameter is one inch or greater.
7. Terminate wiring to patchbays with sources (outputs) appearing on the top row of patch points and destinations (inputs) appearing on the bottom row. Violating this wiring standard for 6 or less patch points is acceptable if it reduces the number of patchbays required and the points are clearly labeled and identified on the patchbays. All normalled patch point pairs shall appear directly above and below one another. Provide blank inserts for all unused patch points.
8. Separate wiring of differing classifications by at least four inches where possible. Where lines of differing classification come closer together than four inches, cross them perpendicular to each other. Bundled and snake cables as defined in Miscellaneous Products shall be exempt from these requirements. Neatly comb and harness wires within consoles by the following classifications of power levels or signal types
  - a. Balanced Microphone Level Audio less than -20 dBm.
  - b. Balanced Line Level Audio from -20 dBm to +30 dBm.
  - c. DC Control or Power less than 48VDC.
  - d. Intercom Line Level Audio and DC Power.
  - e. Serial Communication or Control Network
  - f. Speaker Level Audio greater than +30 dBm.
  - g. Video.
  - h. AC Power.
9. Use only balanced audio circuits unless noted otherwise. Use accepted transformers or interface devices to convert unbalanced circuits to balanced. Certain output signals may be unbalanced if inputs of subsequent devices are within the same or adjacent racks; these are noted on an individual basis.
10. Serve cables as follows
  - a. In general, cover the end of the overall jacket with 1 inch length (min.) heat-shrink tubing. Heat shrink tape or "wrap-around" shrink is not acceptable. This piece of heat-shrink may also carry any wire identification as noted in Paragraph 3.2.D.4. Cut off unused insulated conductors 2 inches (minimum) past heat-shrink, folding the ends back over the jacket, and securing in place with cable tie-wrap.
  - b. Cover shield/drain wires with properly sized sleeving and serve as noted above. Extend sleeving 1/4 inch past the end of unused shield/drain wire.
  - c. For connectors containing more than 4 solder connections, cover each bare wire and solder connection with properly sized, transparent heat-shrink sleeving.
  - d. Cables terminated by cable-type connectors are not required to have the 1 inch heat-shrink tubing on the end of the overall jacket, but shall meet the wire identification requirements as noted in Paragraph 3.2.D.4 and shall have any shields/drain wires insulated with sleeving.
  - e. Do not cut the shield/drain wire of any exposed shielded cable at the end of the overall jacket.
11. Connections
  - a. Make connections using rosin-core solder or accepted mechanical connectors.
  - b. Use crimping tools which are specifically designed for the application. The presence of non-accepted crimping tools in the Contractor's shop or on the job-site shall constitute prima-facie evidence of improper crimp-type connections, and may result in all crimp-type connections being redone.
  - c. Use insulated spade lugs on screw terminals. Do not exceed two lugs per terminal. Do not cut strands from conductors to fit lugs.
  - d. Make connections to loudspeaker transformers with properly sized, closed-end connectors crimped with factory-approved ratchet type tool. Wire nut, electrical tape or "Scotch lock" connectors are not acceptable. Attach loudspeaker transformers to loudspeakers with permanent fasteners inside the loudspeaker enclosure unless specifically noted.

D. Labeling

1. Label products in a logical, legible, and permanent manner corresponding to the drawings. Wording, format, style, color, and arrangement of text will be subject to the Owner's approval.
2. Label the following with engraved, permanently attached Lamicaid™, with white 1/8 inch block letters on black background
  - a. Front of rack mounted equipment indicating device function, e.g. "PROGRAM AUDIO AMPLIFIER" or "S-VHS VCR #1".
  - b. Back of rack mounted equipment indicating references or identifiers to correspond with the device references or identifiers on the Shop Drawings and As-Builts, e.g. "AMP-1" or "VCR-A".
  - c. Barrier strips, terminals, stand-alone transformers, switches, relays, volume controls, and similar devices.
3. Engrave custom receptacles, plates and panels as shown on the drawings, using minimum 1/8 inch lettering with contrasting fill.
4. Permanently label installed wires on both ends with accepted permanent heat-shrink labels. Labels may be either direct hot-stamped or permanently printed heat-shrink labels, or self-adhesive wire numbers under clear heat-shrink. Each wire shall have an individual label with the same label on both ends. Labeling shall match labeling shown on the approved Shop Drawings.
5. Label patchbays to clearly indicate the device and specific input or output for each signal source and destination. Color coding is recommended to aid in grouping signals or identifying signal types. Normalled patch pairs shall be differentiated from non-normalled pairs where sources and destinations appear above and below one another.
6. The Contractor's name shall appear only once on each set of racks, preferably on the AC power control, or as coordinated with the Owner. The Contractor's name shall not appear on wall plates or portable equipment.
7. Provide self-adhesive dots to normally user-adjustable front-panel controls to indicate their nominal settings. Mark controls on mainframe modules on the appropriate internal labels.

E. Programming

1. Coordinate all control systems user interfaces and operation with the Owner's Representative.
2. Programming requirements for all DSP based audio and video routing and processing devices will be based on information provided by the Contract Documents unless otherwise noted. Contractor will make modifications to the programming as required to meet the functional requirements and design intent. Contractor is responsible for the proper functioning of DSP Systems and their associated programming upon substantial completion and after any modification during the warranty period.
3. All software and hardware shall be the latest available versions and all software shall meet manufacturer's standards.
4. Document all passwords for software or devices.
5. The Contractor shall provide one programming revision of the control system a maximum of 60 calendar days after Final Acceptance (Paragraph 3.8). This reprogramming effort should not exceed 8 hours. The intent of this reprogramming is to accommodate minor changes desired by the Owner after use of the system, such as labeling or colors of buttons, timing related to automated sequences, etc.

3.04 TEST EQUIPMENT

A. Use the following test equipment meeting the following minimum specifications to perform the Initial Tests and Adjustments. The Contractor shall have available the same test equipment for the performance of any Final Adjustment and Equalization (Paragraph 3.6.B).

B. Digital Multimeter:

1. DC to 20 kHz bandwidth.
2. 300 V range, 100 mV resolution.
3. 10 Mohm input impedance.
4. Direct reading of dBm across 600 ohm load.
5. DC resistance to 0.1 ohm.

C. Dual Trace Oscilloscope:

1. 100 MHz bandwidth.
  2. 1 mV/CM sensitivity.
  3. Dual time-base capability.
- D. Sweep/Function Generator:
1. Sine, square, sawtooth and DC waveforms
  2. 100 kHz bandwidth
  3. Sweep, trigger, gate modes
  4. 1 sec. to 60 sec. sweep rates; linear or log sweep modes.
  5. Output level of 0 dBm with less than .5% THD
- E. Impedance Bridge:
1. Range: 1 ohm to 1 Mohm.
  2. Three test frequencies, minimum, ranging from 250 Hz to 4 kHz.
- F. Frequency Counter:
1. 1 Hz to 100 kHz range, 1 Hz resolution.
  2. Input impedance of 1 Mohm.
- G. Sound Level Meter - ANSI Type 2.
1. "A", "C", and "Flat" weighting.
- H. Real-time One-Third Octave Audio Spectrum Analyzer:
1. Complies with ANSI S1.4-1971 Type S1A & S1C and IEC 179-1973.
  2. 25 Hz to 20 kHz bandwidth ( $\pm 0.5$  dB) in 30 ISO bands.
  3. "A", "C", and "Flat" one-third octave frequency weighting.
  4. Un-weighted one-octave operation in 10 ISO bands.
  5. Three selectable detector responses.
  6. Dual non-volatile memories with "store" or "accumulate" function.
  7. 1/2 inch free-field microphone with extension cable.
  8. Direct input probe.
- I. Pink Noise Generator:
1. Digital noise generation circuitry.
  2. 20 Hz to 20 kHz bandwidth ( $\pm 0.5$  dB).
  3. 250 kHz clock rate.
  4. > 2 million-bit word length.
  5. 0 to 1.0 Vrms variable pink noise output reference level.
  6. 0 dB to 58 dB attenuation in 2 dB steps.
- J. Distortion Analyzer:
1. Input range: 1 mV to 300V rms.
  2. 10 Hz to 100 kHz frequency range, harmonics indicated to 300 kHz.
  3. Automatic fundamental nulling.
  4. True RMS voltmeter.
  5. Ultra low distortion oscillator.
- K. Polarity Tester:
1. "Source" unit to provide single pulse or encoded sine wave test tone with selectable frequency. Output should be via built-in loudspeaker or multiple audio connectors.
  2. "Detector" unit to provide polarity indication via built-in or external microphone, or multiple audio connectors.
- L. Video Waveform Generator:
1. Signal generator meeting RS-170A timing specifications.
  2. 8-bit signal generation circuitry providing SMPTE color bars, multiburst, pulse and bar with window and modulated pulse, 5-step staircase, modulated 5-step, white field, black burst, and 1 kHz audio tone test signals, and horizontal or vertical scope trigger signal.
- M. Video Waveform Monitor:

1. 50 kHz to 6 MHz frequency response (flat within 5%).
2. Monitor shall provide all commonly used and essential video waveform display modes, calibration signal, relative burst phase indication, dual filter display, and bright CRT with parallax-free internal graticule.

N. Vectorscope :

1. Vectorscope meeting NTSC standards, with a high brightness CRT and internally etched graticule.
2. Input return loss of 40 dB, input isolation of 60 dB, an AC input level range of 1.0V PP,  $\pm 6$  dB and a DC input level range of 5.0V. Phase control range of 360 $\circ$ , vector accuracy of  $\pm 18$ , differential gain of  $\pm 1\%$  and differential phase of  $\pm 18$ .

O. Lightmeter/Photometer :

1. Photographic/cinematographic grade lightmeter capable of taking incident and reflected readings.

P. Laptop Computer:

1. Laptop PC for programming, testing and monitoring DSP-based processing equipment, and use as a source device.
2. Minimum output resolutions of VGA, SVGA, XGA and SXGA.
3. Appropriate adaptors and software for each piece of applicable equipment installed.

Q. Test Media

1. Playback and record media for each media type supported by the systems.

### 3.05 PRE-DELIVERY TESTS

A. Pre-Delivery Tests - Data from the following tests shall be recorded before delivery of equipment to the job site. Submit test data as stated in Paragraph 1.18.

1. Measure and record impedance curves for each type of outboard balancing transformer used and for each type of loudspeaker (with transformer if applicable) used. Impedance shall meet manufacturer's published ratings. Provide written verification that this test has been performed in Pre-Delivery Submittals.
2. Record build-out, termination and pad resistor values; include source and termination impedances used in calculations, and results of tests after installation. Provide a list showing these values in Pre-Delivery Submittals.
3. Make and record the following measurements of each audio system electronic device from every input to every output at maximum rated output. Provide verification that these tests have been performed in Pre-Delivery Submittal.
  - a. Use the following general test conditions
    - 1) Input under test shall be terminated with 150 ohm oscillator; other inputs to be terminated with a 1%/150 ohm shielded resistor.
    - 2) All line-level outputs shall be terminated with a 1%/10 kohm resistor; direct-coupled power amplifier outputs shall be terminated with a resistor equal to the load that the device will nominally see in the final installation; transformer-coupled power amplifier outputs shall be terminated with a load resistor equal to the maximum rated power output.
    - 3) All microphone preamplifiers shall have 50 dB of gain. Line-level devices shall be at unity gain and have equalizers set flat. Power amplifiers shall be set at maximum gain.
    - 4) Data provided by the manufacturer for individual pieces of equipment may be substituted for the following tests. Contractor is still responsible for all equipment meeting the specified performance.
  - b. Measure Clipping Levels
    - 1) Start with a -50 dBu signal at microphone inputs and a +4 dBu signal at line inputs. Increase the signal until the input or output clips. Record input and output levels.
    - 2) Levels shall meet or exceed manufacturer's published ratings.
  - c. Measure T.H.D.
    - 1) Use 20 Hz, 1 kHz and 20 kHz minimum.
    - 2) Distortion shall not exceed manufacturers' published ratings.
  - d. Measure frequency response
    - 1) Use continuous 20 to 20 kHz sweep oscillator and multimeter (or plotter).
    - 2) Frequency response shall not exceed manufacturers' published ratings by more than  $\pm 1$  dB.
  - e. Measure hum and noise
    - 1) Terminate the input under test with a 1%/150 ohm shielded resistor.

- 2) Measure residual hum and noise (20 kHz bandwidth).
- 3) Hum and noise levels shall not exceed manufacturer's published ratings.
4. Make and record the following measurements of each audio system electronic system from inputs to outputs as configured for final installation. Provide verification that these tests have been performed in Pre-Delivery Submittals.
  - a. Use the general test conditions described in Paragraph 3.5.A.4.a above except set the gain controls of components to allow maximum input and output levels at intermediate stages without clipping. The presence of any waveform distortion, interference signals, or oscillations indicates unacceptable performance.
  - b. Measure T.H.D.
    - 1) Use 20 Hz, 1 kHz and 20 kHz minimum.
    - 2) Deviation of more than 0.5% (not including cumulative effects) from the manufactures' specifications indicates unacceptable performance.
  - c. Measure frequency response
    - 1) Use continuous 20 to 20 kHz sweep oscillator and multimeter (or plotter).
    - 2) Deviation of more than -3 dB (not including cumulative effects) from the manufactures' specifications indicates unacceptable performance.
  - d. Measure hum and noise
    - 1) Terminate the input under test with a 1%/150 ohm shielded resistor.
    - 2) Measure residual hum and noise (20 kHz bandwidth).
    - 3) Deviation of more than -3 dB (not including cumulative effects) from the manufactures' specifications indicates unacceptable performance.
5. Make and record the following measurements of each video system electronic device from every input to every output. Provide verification that these tests have been preformed in Pre-Delivery Submittal.
  - a. Measure Impedance
    - 1) Measure and record impedance for each input and output.
    - 2) Impedance shall meet manufacturer's published ratings.
  - b. Throughput Bandwidth
    - 1) Measure and record throughput bandwidth from initial inputs to final outputs as configured for final installation.
    - 2) Use continuous 20 to 20 kHz sweep oscillator and multimeter (or plotter).
    - 3) Frequency response shall not exceed manufacturers' published ratings more than  $\pm 1$  dB.
  - c. For each Distribution Amplifier
    - 1) Connect a TV test signal of 100 IRE peak luminance at the input of each device and measure the frequency response at the output of the device with a waveform monitor. Verify that the signal does not exceed 4% loss at 4.2 MHz.
    - 2) With no signal at the input of each device, measure noise levels at the output(s) with a waveform monitor. Verify noise voltage levels do not exceed -55 dB, which is 2.0 mV peak-to-peak, referenced at 1.0 V peak-to-peak.
6. After pre-assembly of racks, measure and record the following and provide recorded measurements in list form in Pre-Delivery Submittals
  - a. Verify DC resistance between the chassis of each electronic device and the rack ground bus bar is less than or equal to 0.1 ohm.
  - b. Verify DC resistance between the signal common of each electronic device and the rack ground bus bar is less than or equal to 0.1 ohm.
7. Measure and record the AC voltages between hot, neutral, and ground for all on-site power directly related to the Audiovisual systems and verify correct polarity of AC power. Provide a list showing these values in Pre-Delivery Submittals.
8. Measure and record the resistance between the ground wires and the building entrance ground for all on-site circuits and dedicated grounds provided for support of the Audiovisual systems. If the resistance is greater than 0.1 $\Omega$ , notify the Owner's Representative, Electrical Contractor and General Contractor. Provide a list showing these values in Pre-Delivery Submittals.

### 3.06 SUBSTANTIAL COMPLETION TESTS AND ADJUSTMENTS

- A. Post-Delivery Tests - Data from the following tests shall be recorded before performing the adjustments and equalization in Paragraph 3.6.B, 3.6.C, 3.6.D. Submit test data as stated in Paragraph 1.19.
  1. Make and record the following measurements of each audio system.
    - a. Verify proper polarity and continuity of the entire System. Test and correct any problems.

- Provide verification that these tests have been performed in the Substantial Completion Submittals.
- b. Measure and record the following for each microphone, line level and production communication line. Provide verification that the following tests have been performed in Substantial Completion Submittals
    - 1) Proper polarity (pin 2 to pin 2, pin 2 to tip, etc.).
    - 2) Unbalanced lines, any conductor or shield shorted to ground.
    - 3) Resistance between conductors when pins 2 & 3 are shorted at the receptacle.
    - 4) Resistance between conductors when pins 2 & 3 are open at the receptacle.
  - c. Measure and record impedance curves of all loudspeaker lines at amplifier rack terminal barrier strips. Take measurements at a minimum of 3 frequencies (approximately 100Hz, 1kHz and 10kHz) with continuous 20 to 20 kHz preferred. Minimum impedance should not be less than 70% of the calculated load over the nominal bandwidth of the system. Provide recorded values in Substantial Completion Submittals.
    - 1) If the power amplifier uses an outboard transformer or autoformer, repeat the above test to verify the actual load seen by the power amplifier output terminals.
  - d. Measure and record that proper polarity of all loudspeakers is maintained by measuring each loudspeaker with the polarity tester and by applying pink noise to each system and walking through the transition areas of coverage from one loudspeaker to the next. Transition should be smooth with no apparent shifting of source from one loudspeaker to the next. Provide verification that these tests have been performed in Substantial Completion Submittals.
  - e. Verify and document correct absolute system polarity such that a positive pressure on the front of all microphone diaphragms and a positive voltage on each line level input positive terminals/connections will generate a positive voltage at all positive terminals/connections, and will generate a positive acoustic pressure from all loudspeakers. Verify that all microphone or line inputs and source equipment produce the same results. Provide verification that these tests have been performed in Substantial Completion Submittals.
  - f. With the system configured for typical set-up, verify and document correct normal operation for each audio system receptacle with the appropriate microphone, line level source, production communication device or loudspeaker as required. Provide verification that these tests have been performed in Substantial Completion Submittals.
  - g. Apply a sine-wave sweep signal to each loudspeaker system, sweeping from 50 Hz to 5000 Hz at a power amplifier output level which is 10 dB below the loudspeaker's rated input power. Listen for rattles or objectionable noise and correct if apparent. Provide verification that these tests have been performed in Substantial Completion Submittals.
2. Make and record the following measurements of each video system electronic system.
- a. Measure hum by connecting a video test signal of 100 IRE peak luminance to one end of each 75 ohm precision video cable and measure level of hum at the other end of the cable with a TV waveform monitor (set for scanning at frame rate). Hum should be no more than 2% of the signal level of 100 IRE. Provide verification that these tests have been performed in Substantial Completion Submittals.
  - b. Measure line loss by connecting a Video Waveform generator window signal that goes up to peak white at one end of each 75 ohm precision video and measure the line loss at the other end of the cable with a waveform monitor. The signal should not exceed a line loss of more than 10 IRE. Also, if burst is less than 35 IRE, then cable equalization is required. Provide verification that these tests have been performed in Substantial Completion Submittals.
  - c. Measure and record the termination impedance of all video lines. Verify that each run of video cabling is terminated at the farthest point into 75 ohm +/- 1 ohm. Provide verification that these tests have been performed in Substantial Completion Submittals.
  - d. Check and record the video level on each circuit with SMPTE color bars from the test generator measured with a video waveform monitor verifying 100 units of video at peak white, 7.5 units of video at the pedestal level and -40 units of sync. Provide verification that these tests have been performed in Substantial Completion Submittals.
  - e. Check and record the frequency response of each circuit with multiburst from the video waveform generator, measured by a waveform monitor, verifying not more than 2 IRE units difference between the lowest and highest burst packets. Provide verification that these tests have been performed in Substantial Completion Submittals.
  - f. Using a full white field from a video waveform generator as a source, measure and record the projected image brightness at the center of the image, the midpoint of each edge of the image and the corners of the image. Provide recorded values in Substantial Completion Submittals.
  - g. Verify that all projected and displayed images are free of visible hum, noise, tearing, and or any

- other image aberrations. Verify this for all possible source and display combination as per the Contract Documents. Provide verification that these tests have been performed in Substantial Completion Submittals.
- h. Verify and record each field receptacle for proper, normal operation with a video source or record device as required, with the system configured for typical setup. Provide verification that these tests have been performed in Substantial Completion Submittal.
- B. Audio Systems Adjustments - The Contractor will adjust the installed sound system to the crossover, gain structure, delay, equalization and output level specifications provided below. Submit all test data as described in Paragraph 1.19 before scheduling any Final Tests (Paragraph 3.7). Further adjustments may be required during any Final Tests (Paragraph 3.7).
1. All equipment referred to shall include physical devices as well as DSP-based devices with equivalent functionality.
  2. All crossover filters and networks for all loudspeakers should be adjusted according to the loudspeaker manufacturer's recommendations before any other adjustment or equalization is performed. Provide verification that these tests have been performed in Substantial Completion Submittals.
  3. Gain structure shall be set using a -67 dBu pink noise source for microphone level inputs, and a +4dBu pink noise source for line level inputs. Adjust each channel for the signal that is normally applied to it. Provide verification that the following tests have been performed in Substantial Completion Submittals:
    - a. For each balanced microphone input on all manual and automatic mixers, adjust input gain (trim) control such that the channel level meter shall maintain 0VU (15dBfs for meters on digital devices) with the channel gain (fader) set to unity. After adjusting all microphone inputs, verify that all input gain (trim) controls are set to the same position. If any are not, calibrate the meters on those particular channels as necessary per the manufacturer's recommendations, and repeat the gain adjustment process.
    - b. For dedicated microphone pre-amplifiers, adjust gain such that balanced line level output shall be measured to be +4dBu.
    - c. For each balanced line input on all manual and automatic mixers, adjust input gain (trim) such that any channel level meter shall maintain 0VU (-15dBfs) with the channel gain (fader) set to unity. After adjusting all line inputs, verify that all input gain (trim) controls are set to the same position. If any are not, calibrate the meters on those particular channels as necessary per the manufacturer's recommendations, and repeat the gain adjustment process.
    - d. For each manual mixer and automatic mixer, output busses shall pass the signal at unity level. Verify that input channel meters, internal mix bus meters, and all output bus meters maintain identical levels for a given input. Verify that the measured output of any bus is equal to the measured input of the channel or bus assigned to that bus.
    - e. All line level signal processing equipment and distribution amplifiers shall pass the signal at unity level.
    - f. Adjust amplifier gain to meet the output levels as specified.
  4. Audio signal delay shall be initially set as described in the Contract Documents. All delays shall be set using TDS (TEF), MLS or FFT analysis and shall be verified in listening tests. Provide verification that the following tests have been performed in Substantial Completion Submittal:
    - a. Delays for multi-way speaker systems shall be set such that the signals arriving from any speaker at the listening position on-axis of the high frequency driver of that speaker shall be time aligned.
    - b. Delays for speaker clusters shall be set to provide a common acoustic center such that a coherent acoustic wavefront is produced by the cluster.
    - c. Delays for distributed speakers or satellite clusters shall be adjusted such that within the -6dB coverage of the speaker concerned the longest delay between the direct sound and the speaker being measured shall be less than 30ms. At no point within the -6dB coverage of the speaker concerned should the sound from the speaker being measured arrive before the direct sound.
  5. Adjust equalization, coverage and output levels for each system, with the gain structure set as specified above, and a pink noise source maintaining 0VU (-15dBfs) on all level meters. All dB measurements are assumed to be dBSPL.
    - a. Left and Right program audio speaker systems.
      - 1) Adjust the system such that normal operating level generates 95dB C-weighted throughout the entire direct coverage area of the system.
      - 2) Coverage for each system shall be within +/- 3dB throughout the direct coverage area of the system for the normal operating level, using an octave band of pink noise centered at 4kHz.

- 3) Frequency response, averaged over a minimum of 9 points distributed throughout the coverage area, shall be flat (+/- 3dB) from 50Hz to 16kHz. Below 50Hz, roll-off shall occur at - 6dB per octave, with roll-off being achieved through the use of a high-pass filter only. Above 16kHz, roll-off shall occur at -3dB per octave to 18kHz and at -6dB per octave thereafter.
  - 4) Maximum operating level for each system shall generate 105dB C-weighted throughout the entire direct coverage area of the system.
  - 5) After adjustments are complete measure and record the following. Provide the recorded data in the Substantial Completion Submittal.
    - a) Normal system operating levels at a minimum of nine points distributed throughout the coverage area.
    - b) Frequency response at a minimum of six points distributed throughout the coverage area and an average response for these six points. Provide the recorded data in graphical form.
    - c) Maximum operating level one point located in the direct coverage field.
  - b. Distributed speaker systems.
    - 1) Adjust the system such that normal operating level generates 85dB C-weighted throughout the entire direct coverage area of the system.
    - 2) Coverage for each system shall be within +/-3dB throughout the direct coverage area of the system for the normal operating level, using an octave band of pink noise centered at 4kHz.
    - 3) Frequency response, averaged over a minimum of 6 points distributed throughout the coverage area, shall be flat (+/- 3dB) from 80Hz to 12kHz. Below 80Hz, roll-off shall occur at - 12dB per octave, with roll-off being achieved through the use of a high-pass filter only. Above 12kHz, roll-off shall occur at -6dB per octave.
    - 4) Maximum operating level for each system shall generate 95dB C-weighted throughout the entire direct coverage area of the system.
    - 5) After adjustments are complete measure and record the following. Provide the recorded data in the Substantial Completion Submittal.
      - a) Normal system operating levels at a minimum of six points distributed throughout the coverage area.
      - b) Frequency response at a minimum of six points distributed throughout the coverage area and an average response for these six points. Provide the recorded data in graphical form.
      - c) Maximum operating level one point located in the direct coverage field.
  - c. In bi-amplified, tri-amplified or quad-amplified speaker systems, initial system equalization shall be accomplished using amplifier gain before any other equalization is applied. Record amplifier settings derived and provide verification that these tests have been preformed in the Substantial Completion Submittals.
  - d. Minimum feedback stability margin (using the same microphone that will be used by the Owner) shall be 6dB with the system equalized. Any additional equalization required to obtain this feedback stability margin shall be performed only after the systems equalization specified above is performed. Provide verification that these tests have been preformed in the Substantial Completion Submittals.
  6. After the above tests and settings have been preformed record all equipment settings including but not limited to equalization curves, crossover filters, delay settings, gain settings, etc.
  7. If the systems are unable to meet the specified performance for any reason, immediately notify the Owner's Representative in writing. Contractor shall include the results obtained, any observed or suspected causes for failure to meet the specified performance, and any suggested or recommended solutions.
  8. Coordinate final equalization and output levels with the Owner's Representative.
- C. Video Systems Adjustments – The Contractor will test and adjust the installed systems as detailed below. Further adjustments may be required during any Final Tests (see Paragraph 3.7).
1. Verify that all projected and displayed images are square and plumb. Provide verification that these tests have been performed in Substantial Completion Submittals.
  2. Adjust all projectors and display devices for all Owner Furnished laptops or computers indicated on the Drawings and for all standard computer display formats up to SXGA. Provide verification that these tests have been performed in Substantial Completion Submittals.
  3. For each distribution amplifier connect a video test signal of 1 V p-p, 75% color bars at the input of each device and, with a waveform monitor, adjust the output of the device to unity gain  $\pm 5$  dB. Provide verification that these tests have been performed in Substantial Completion Submittals.

4. Adjust white balance, color and gain for each adjustable video source including cameras to SMPTE standards. Provide verification that these tests have been performed in Substantial Completion Submittals.
5. After the above tests and settings have been performed record all equipment settings.
6. If the systems are unable to meet the specified performance for any reason, immediately notify the Owner's Representative in writing. Contractor shall include the results obtained, any observed or suspected causes for failure to meet the specified performance, and any suggested or recommended solutions.

### 3.07 FINAL TESTS

- A. Final Tests shall take place after submittal of the Substantial Completion Submittals in Paragraph 1.19.
- B. Schedule a time for the Owner's Representative to perform the Final Tests. Notify the Owner's Representative at least fourteen calendar days in advance.
- C. Furnish a technician who is familiar with the system to assist the Owner's Representative during any Final Tests and Adjustment. Supply test equipment as noted in Paragraph 3.4. Allow 8 hours for these tests.
- D. Under the direction of the Owner's Representative, adjust the systems as required to achieve the final specified or desired performance. Additionally, any test from the Initial Tests and Adjustments may also be performed by the Owner if deemed necessary.
- E. If the Owner's Representative is unable to perform any of the Final Tests due to errors, omissions, problems or inaccuracies by the Contractor, the Contractor shall be responsible for costs incurred for additional review.
- F. The Owner may elect to verify test data and system performance as part of the acceptance procedure. Provide personnel and equipment, at the convenience of the Owner, to reasonably demonstrate system performance and to assist with such tests without additional cost to the Owner. These tests and demonstrations are in addition to any Owner's Representative testing, or the instructional requirements outlined in Paragraph 3.8.
- G. Record final settings on all Systems and incorporate into the Final Contract Close-out Submittals.

### 3.08 INSTRUCTION

- A. Contractor shall furnish qualified individual(s) to provide a minimum 8 hours of instruction with the Owner or his designated representative regarding the design, features and proper operation of the Systems. Coordinate the scheduling, course material and content with the Owner.

### 3.09 FINAL CLEANING

- A. At completion of work, remove all rubbish, all tools, scaffolding, and surplus materials from the building and shall leave the building clean and habitable.
- B. At completion of work, thoroughly sweep floors and dust flat surfaces such as cabinet tops, counters and window sills. Clean windows and projection screens in the areas affected by the work.
- C. Coordinate removal or storage of packing materials with the Owner. Contractor shall remove all packing materials from the building unless otherwise directed.
- D. If Contractor fails to clean up, Owner may do so and the cost thereof will be charged to the Contractor.

### 3.10 FINAL ACCEPTANCE

- A. Final acceptance of the installation shall be the sole responsibility of the Owner and will be based upon the report of the Owner's Representative following the Final Tests and upon receipt of acceptable Final Contract Close-out Submittals and Instruction documentation.

B. The failure of a representative of the Owner, Project Manager, Owner's Representative, Architect or Consultant to condemn any defective work or material shall not release the Contractor from the obligation to promptly remove and replace the same at any time before final acceptance upon discovery of said defective work or material without claim for additional payment.

**END OF SECTION**



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## SECTION 11 131 - PROJECTION SCREENS

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. Front Projection Screens
  
- B. Related Sections:
  - 1. General Conditions: Division
  - 2. Wood and Plastics: Division 6
  - 3. Doors and Windows: Division 7
  - 4. Electrical: Division 16

#### 1.02 REFERENCES

- A. SMPTE - Recommended Practice (RP) 94, Determination of Screen Gain

#### 1.03 SUBMITTALS

- A. Shop Drawings: Plans at a minimum scale of 1/8" = 1'0" and installation details at a minimum scale of 1/4" = 1'0".
  
- B. Provide manufacturer's product information or "cut sheets" for each type of projection screen specified. Identify the product for which the information is being submitted for approval including a specification paragraph reference and an application reference (room identifier, etc.). Clearly identify any options or selections.
  
- C. Provide the following product samples:
  - 1. Screens: Minimum 4" x 3" sample of each proposed screen material.
  - 2. Masking or Borders: Minimum 4" x 3" sample of proposed border or masking materials.
  - 3. Frame: Minimum 1' length of proposed framing system.

#### 1.04 QUALITY ASSURANCE

- A. Quality of Materials and Workmanship:
  - 1. All screens of a single type or application shall be by the same manufacturer.
  - 2. No manufacturer other than those specified will be considered acceptable without prior written approval.
  
- B. Where contract documents indicate requirements less restrictive than those indicated in 1.04 A, comply with the minimum requirement therein.
  
- C. Installer Qualifications: Installation shall be by the General Contractor or one of his subcontractors. All screens of a single type shall be installed by the same entity.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Inspect screens immediately upon delivery. Note any visible damage on the freight bill. If concealed damage is discovered, immediately call the delivering carrier for an inspection.
  
- B. Reseal the shipping crate or container after inspection.
  
- C. Store screens upright in their original crate or container in a secure air-conditioned space until ready for installation.
  
- D. Use extreme care in unpacking. Do not use knives or box cutters to remove wrapping or packing

material. Wear soft cotton gloves when handling screens.

#### 1.06 PROJECT CONDITIONS

- A. Scaffolding, Platforms, Etc. - Contractor or his subcontractors shall furnish and maintain all equipment such as temporary stairs, ladders, ramps, platforms, scaffolds, hoists, runways, derricks, chutes, elevators, etc., as required for proper execution of the work. All apparatus, equipment, and construction shall meet all requirements of the Labor Law, safety regulations, and other State or local laws applicable thereto.
- B. Construction Cleaning - Contractor shall keep premises clean during progress of the Work. Remove waste materials and rubbish caused by employees, subcontractors, and installing material men at the end of each day. Prior to and during process of painting and varnishing, clear area where such work is in progress of all debris, rubbish, and building materials which may cause dust. Clean floors as required and take all possible steps to keep area dust free.
- C. Protection of Existing Work - Existing work shall be properly protected. Any work damaged by failure to provide protection shall be removed and replaced with new work at Contractor's expense.

### **PART 2 PRODUCTS**

#### 2.01 AUDITORIUM FLOWN FRONT PROJECTION SCREEN

- A. Front projection screen and frame flown from stage rigging.
  - 1. Lace and grommet tensioned screen surface.
  - 2. High contrast gray screen material with a minimum on-axis screen gain of 1.1, as determined by SMPTE RP 94.
  - 3. Minimum 90° horizontal viewing angle.
  - 4. Minimum 40° half gain angle.
  - 5. Screen material shall be washable and flame retardant.
  - 6. Frame constructed of aluminum tubing, minimum 2" diameter for single tube style or 1" diameter for truss style construction.
  - 7. Non-reflective black masking covering lacing and frame.
  - 8. 13' high by 17'-4" wide, 4:3 format image area.
  - 9. Coordinate mounting with stage rigging.
  - 10. Acceptable: Da-Lite Lace and Grommet with High Contrast Cinema Vision screen fabric and black masking or Stewart Filmscreen AT3-M with FireHawk screen fabric and VE-LUX masking.

### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- A. Field verify dimensions for compliance with manufacturer's recommendations.
- B. Do not proceed with the installation until unsatisfactory conditions have been corrected.

#### 3.02 INSTALLATION

- A. Auditorium Flown Front Projection Screen shall be installed by the party responsible for the rigging installation.
- B. Install screens in accordance with the manufacturer's recommendations.
- C. Coordinate all trim work and millwork with Owner. All millwork and trim out designs shall be approved by the Architect
- D. Coordinate all electrical power connections with Owner.
- E. Provide final protection and maintain conditions in a manner that complies with the manufacturer's

recommendations such that projection screens do not deteriorate and are undamaged at the time of Substantial Completion.

- F. Replace screens, frames or housings that cannot be cleaned or repaired in a manner acceptable to the Owner's Representative prior to Substantial Completion.
- G. Projection screens shall be installed as shown on the Drawings. Use the image area for determining the center and limits of the screens, do not use the housing or enclosure.
- H. Projection screens, housings and framing systems shall NOT be field modified, cut, drilled or altered from their as delivered configuration. All electrical connections shall be made per factory specifications, and all wire shall be routed through prefabricated knockouts or passthroughs.
- I. Only factory supplied or approved hardware shall be used for mounting.
- J. Extreme care shall be exercised in handling of the screens. No scratches or tears are permissible.

### 3.03 ADJUSTING

- A. Tolerances - Variations from Plumb, Level and Square:  $\pm 1/32"$ .

### 3.04 CLEANING

- A. Remove any dust from screens, frames or housings with a soft clean cloth. Dust can be removed from front projection screens using a vacuum cleaner fitted with a pressure bypass fitting wrapped in a clean cloth.
- B. Soiled, discolored or stained front projection screens shall be replaced.
- C. Remove soil marks from screens, frames or housings with mild soapy water and a cloth or sponge. Blot to dry. DO NOT USE SOLVENTS OF ANY KIND.
- D. Remove surplus materials, rubbish and debris from installation area upon completion of the Work. Leave the installation area in a neat and clean condition.

### 3.05 TESTING

- A. Verify proper operation of screens and controls.
- B. Verify that projection screens provide a flat surface with no wrinkles or other variations.
- C. Replace screens, frames or housings that cannot be repaired in a manner acceptable to the Owner's representative prior to Substantial Completion.

**END OF SECTION 11 131**



**SECTION 11165**

**DOCK BUMPERS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Dock bumpers of reinforced rubber with attachment frame.

1.02 RELATED SECTIONS

- A. Section 03100 - Concrete Forms and Accessories: Placement of bumper anchors into concrete loading dock.

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate unit dimensions, method of anchorage, and details of construction.
- C. Manufacturer's Installation Instructions: Indicate special installation requirements.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS

- A. Dock Bumpers:
  - 1. Durable Corp.
  - 2. R.C. Musson Rubber Co.
  - 3. Superior Bumper Products.
  - 4. Substitutions: See Section 01600 - Product Requirements.

2.02 COMPONENTS

- A. Bumpers: Molded rubber, ozone resistant, nylon reinforced, minimum Shore A Durometer of 70, tensile strength of 950 to 1050 psi:
  - 1. Thickness From Wall: 3 inches.
  - 2. Vertical Height: 10 inches.
  - 3. Width: 5 inches.
  - 4. Profile: Rectangular.
- B. Attachment Hardware: 3/4 inch diameter galvanized bolts and expansion shields.
- C. Touch-up Primer: Zinc rich type.

**PART 3 EXECUTION**

3.01 EXAMINATION

- A. Verify that anchor placement is acceptable.

3.02 PREPARATION

- A. Provide integral anchors for placement by Section 03100.

3.03 INSTALLATION

- A. Install dock bumpers in accordance with manufacturer's instructions.
- B. Set plumb and level.

3.04 SCHEDULES

- A. Main Loading Dock: 2 per bay (total of 6).

**END OF SECTION**

## SECTION 11 452 - RESIDENTIAL EQUIPMENT

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Kitchen appliances.

#### 1.02 RELATED SECTIONS

- A. Section 16155 - Equipment Wiring: Electrical connections for appliances.

#### 1.03 REFERENCES

- A. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory; Underwriters Laboratories Inc.; current edition.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data indicating dimensions, capacity, operating features of each piece of residential equipment specified, and operating instructions.
- C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

#### 1.05 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.
- C. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.
- D. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

### PART 2 PRODUCTS

#### 2.01 KITCHEN APPLIANCES

- A. Washer
  - 1. Basis of Design Manufacturer: LG Electronics
    - a. Model: WM1814CW
  - 2. Location: Costume Maintenance 140
  - 3. Features: Front loading; Stainless Steel Interior
  - 4. Exterior Finish: Painted steel
    - a. Color: White
- B. Dryer
  - 1. Basis of Design Manufacturer: LG Electronics
    - a. Model: DLE2514W
  - 2. Location: Costume Maintenance 140
  - 3. Features: Stainless steel interior
  - 4. Exterior Finish: Painted steel
    - a. Color: White

- C. Dishwasher 1
  - 1. Basis of Design Manufacturer: Bosch
    - a. Model: SHE43C05UC
  - 2. Location: Storage 116
  - 3. Finish: Stainless steel
  
- D. Dishwasher 2
  - 1. Basis of Design Manufacturer: Bosch
    - a. Model: SHE43C02UC
  - 2. Location: Prep Area 138
  - 3. Finish: White
  
- E. Refrigerator
  - 1. Basis of Design Manufacturer: General Electric
    - a. Model: GTS22JBPWW
    - b. Accessories:
      - 1) Ice maker: General Electric Model IM4A
      - 2) Water filter:
  - 2. Location: Prep Area 138
  - 3. Finish: White
  
- F. Microwave Oven 1
  - 1. Basis of Design Manufacturer: Panasonic
    - a. Model: NN-T965SF
  - 2. Location: Storage 116
  - 3. Finish: Stainless steel.
  
- G. Microwave Oven 2
  - 1. Basis of Design Manufacturer: Panasonic
    - a. Model: NN-S954WF
  - 2. Location: Prep Area 138
  - 3. Finish: White
  
- H. Double Oven
  - 1. Basis of Design Manufacturer: General Electric
    - a. Model: JTP48BF/SF/SS
  - 2. Location: Storage 116
  - 3. Finish: Stainless steel.
  
- I. Ice maker
  - 1. Basis of Design Manufacturer: Scottsman
    - a. Model: AFE325AS-1B
    - b. Accessories:
      - 1) Water filter:
  - 2. Location: Storage 116
  
- J. Ice Storage Bin
  - 1. Basis of Design Manufacturer: Scottsman
    - a. Model: HBT350B
  - 2. Location: Ticketing/Gifts/Concessions 115
  
- K. Coffee Maker 1
  - 1. Basis of Design Manufacturer: Bunn
    - a. Model: CWTF15-APS
    - b. Accessories:
      - 1) 2.5 Liter Airpot: Model 13041.0001
        - a) Quantity: 2
      - 2) Water filter

2. Location: Tickets/Gifts/Concessions 115

**PART 3 EXECUTION**

3.01 EXAMINATION

- A. Verify utility rough-ins are present and correctly located.

3.02 INSTALLATION

- A. Install appliances in accordance with manufacturer's instructions.  
B. Anchor built-in equipment in place.

3.03 ADJUSTING

- A. Adjust operating equipment to efficient operation.

3.04 CLEANING

- A. Remove packing materials from equipment.  
B. Wash and clean equipment.

3.05 OPERATION

- A. Run each appliance through one complete operational cycle.  
B. Verify that all system connections are free of leaks in fittings, filters, or supply lines.

**END OF SECTION**



## SECTION 11 710 - PAINT BOOTH INSTALLATION

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. All labor and materials necessary for the installation of Owner-supplied paint booth.
- B. The work includes, but not limited to, the following:
  - 1. Anchorage of the paint booth to the building slab.
  - 2. Coordination and final electrical connection of the paint booth power to the building electrical service.
  - 3. Coordination and installation of the Owner-supplied exhaust ductwork through the roofing.
  - 4. Coordination and installation of the fire suppression system.

#### 1.02 RELATED SECTIONS

- A. Section 07411 – Metal Roof.
- B. Section 16110 – Conduit and Raceways.
- C. Section 16120 – Conductors.
- D. Section 16130 – Outlet Boxes and Junction Boxes.

#### 1.03 REFERENCES

- A. National Fire Protection Association (NFPA) 13: Standard for the installation of Sprinkler Systems, latest edition.
- B. National Fire Protection Association (NFPA) 33: Standard for Spray Application Using Flammable and Combustible Materials, latest edition.
- C. Occupational Safety and Health Act (OSHA) – Paragraph 1910.107(b)(5)(iv): Requirement for Automatic Fire Suppression System.

#### 1.04 PRE-INSTALLATION MEETING

- A. Convene one week before starting work of this section.

### PART 2 PRODUCTS – NOT USED

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Examine area to receive paint booth and coordinate final location with exhaust ducting and structure above.
- B. Confirm location of power for paint booth.

#### 3.02 PREPARATION

- A. Lay out location of anchor bolts as indicated on the paint booth manufacturer's layout shop drawings.

#### 3.03 INSTALLATION

- A. Install paint booth in accordance with manufacturer's instructions.
  - 1. Anchor paint booth to floor using anchor bolts as recommended by the booth manufacturer.
  - 2. Make final connection of exhaust duct to roofing flange collar.
  - 3. Make final connection of electrical power from building service disconnect to paint booth junction box.
  - 4. Install all sprinkler piping and sprinkler heads as required and as recommended by the booth manufacturer for complete automatic fire suppression system.

**END OF SECTION**

## SECTION 12 200 - THEATRE SEATING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Fixed theatre seating.

#### 1.02 RELATED SECTIONS

- A. Section 01 030 Bid Alternates: Seating and fabric configurations.
- B. Section 01 210 Allowances: Allowances for Seating.

#### 1.03 REFERENCES

- A. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association; 1999.

#### 1.04 SYSTEM DESCRIPTION

- A. Fixed and movable theatre seating with flip up seat, cushioned and upholstered seat and back and plastic back panel and seat bottom. Chairs along aisles shall have recessed aisle lights in end panels. Lay out as shown on the Drawings.

#### 1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's technical data and installation instructions for type of chair to be installed.
- C. Shop Drawings: Provide a minimum 1/4" = 1'-0" plan of auditorium developed from the contract documents showing all chair sizes with clearances. Indicate field verified location of electrical service rough-in for connection of aisle lighting. The Contractor shall be responsible for the accuracy of all chair measurements shown on the plan.
- D. Samples: Submit, for verification purposes, samples of each exposed material from which chairs are composed, in each color, finish, pattern and texture indicated. If these qualities are not indicated, submit, for initial selection, manufacturer's color charts or samples of actual materials showing full range of standard colors, finishes, patterns and textures available.
  - 1. Fabric: Prepare drawings or diagrams indicating proposed layout of upholstery fabric indicating repeats of fabric patterns.
  - 2. Seams: Indicate type and location of all fabric seams.
- E. Mock up: Submit, for verification purposes, a mock up of the specified chair upholstered in the approved fabric. If it is acceptable to the Architect, it may be incorporated into the project.
- F. Certificates: Certify that products of this section meet or exceed fire performance requirements.
- G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

#### 1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section,

with not less than three years of documented experience.

- B. Installer Qualifications: Company specializing in performing the work of this section and approved by manufacturer.

1.07 PRE-INSTALLATION MEETING

- A. Convene one week before starting work of this section.

1.08 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver seating to project site at a proper time for installation that will not interfere with other trades operating in the building.

1.09 PROJECT CONDITIONS

- A. Coordinate installation with flooring materials.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Do not install until spaces are clean and building HVAC system is fully operational.

1.11 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty for chairs.

1.12 EXTRA MATERIALS

- A. See Section 01600 - Product Requirements, for additional provisions.
- B. Supply two (2) chairs for Owner's use in maintenance of project.
- C. Supply five (5) yards of extra fabric for Owner's use in maintenance of project.

**PART 2 PRODUCTS**

2.01 SEATING

- A. Upholstered Seating:
  - 1. Manufacturer: KI
    - a. Chair Model: Concerto

2.02 MATERIALS

- A. Steel: All steel shall have smooth surfaces and be of sufficient gauge thickness and designed to withstand strains of normal use and abuse.
  - 1. Front row of seating shall be manufacturer's standard removable chairs.
- B. Padding Material: Seat and back padding material shall be of new (prime manufacture) polyurethane foam. Padding shall be 3" thick on the seat and 3" thick on the back and shall comply with flammability requirements of the applicable codes.
- C. Seat shells: Injected molded plastic, high impact resistant with a textured finish. Color: black.
- D. Armrests: Wood, stain to be selected from manufacturer's standards.

- E. Upholstery Fabric: Customer's Own Material (COM).
  - 1. Manufacturer: ArcCom Fabrics
    - a. Pattern: Grammercy Park; AC 67051.
    - b. Color: Cranberry
    - c. ArcCom Fabric Contact: Ms. Patricia Clinton  
Telephone: (404) 233-0722
- F. Finish:
  - 1. Metal Parts: Metal parts shall be finished in high quality baking enamel or powder coating of approved color and oven baked.
  - 2. Hardware: All assembly hardware shall be rust resistant, black plated.
- G. End panels:
  - 1. Wood veneer on particle board.
    - a. Species: As selected from manufacturer's standard veneers.
- H. Aisle Lighting: Provide recessed aisle lights with round louver type covers at alternating opposite sides of aisles.

#### 2.03 ACCESSORIES

- A. Handicapped Aisle Access Standards: Provide aisle standards to allow wheelchair to seat transfer. Standards shall be marked for identification as handicapped accessible.
  - 1. Quantity: 12
  - 2. Location: To be determined with seating layout.
- B. Row Numbering Plates: Provide manufacturer's standard row numbering plates for row identification.
- C. Seat Numbering Plates: Provide manufacturer's standard seat numbering plates for seat identification.

### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- A. Verify that floors are level and flooring material is in place before installing chairs.

#### 3.02 UPHOLSTERY

- A. General: The Seating Manufacturer shall be responsible for the timely ordering of seating fabric, fabric delivery to seating manufacturer, any necessary testing and approvals, and cost of all associated handling and shipping.
- B. Order and receive C.O.M. for installation on seating.
  - 1. The Seating Manufacturer shall order fabric directly from the fabric supplier for shipping to seating manufacturing site. The Seating Manufacturer shall order the fabric in a timely manner in coordination with the manufacturing schedule and delivery to the project site. Confirmation of the ordering of the fabric and the subsequent delivery to the manufacturer shall be made in writing to the Architect and Owner.
- C. Ship C.O.M. fabric to seating manufacturer for installation on chairs.
- D. Inspect fabric prior to installation. Test or otherwise prepare the fabric for installation on the seating substrate. Install no defective, unapproved or unusable material.
- E. Install fabric in a layout or repeat as indicated on the approved shop drawing.

#### 3.02 INSTALLATION

- A. Install seating in accordance with manufacturer's instructions and in locations indicated on approved shop drawings.
- B. Attach to floor per the manufacturer's standard attachment. Provide 2 bolts per standard.
- C. Coordinate connection of power to aisle lighting.

**3.03 ADJUSTMENT**

- A. Adjust seats for smooth operation.

**3.04 CLEANING, PROTECTION AND TESTING**

- A. Clean all surfaces.
- B. Protect installed chairs from subsequent construction operations.
- C. Replace any upholstery which has been damaged in installation or prior to substantial completion.
- D. Do not permit subsequent work in theater that might damage seating.
- E. Examine aisle light operation and repair or replace improperly functioning units as necessary.

**END OF SECTION**

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## SECTION 12 486 - FLOOR MATS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Vinyl link mat.
- B. Recessed frame.

#### 1.02 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating properties of mat, component dimensions and recessed frame characteristics.
- C. Shop Drawings: Indicate dimensions and details for recessed frame.
- D. Samples: Submit two samples, 12x12 inch in size illustrating pattern, color, finish, edging.
- E. Maintenance Data: Include cleaning instructions, stain removal procedures.

#### 1.03 PROJECT CONDITIONS

- A. Verify that field measurements are as indicated.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Recessed Walk-Off Mats:
  - 1. Arden Architectural Specialties, Model G-275 EnvIRONtread. with F-10 frame.
  - 2. Substitutions: See Section 01600 - Product Requirements.

#### 2.02 FABRICATION

- A. Construct recessed mat frames square, tight joints at corners, rigid. Coat surfaces with protective coating where in contact with cementitious materials.
- B. Fabricate mats in single unit sizes; fabricate multiple mats where indicated.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that floor opening for mats are ready to receive work.

#### 3.02 PREPARATION

- A. Verify size of floor recess before fabricating mats.
- B. Vacuum clean floor recess.

#### 3.03 INSTALLATION

- A. Install mat frames to achieve flush plane with finished floor surface.
- B. Install mats in floor recess flush with finish floor after cleaning of finish flooring.

**END OF SECTION**

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## SECTION 12 492 - VENETIAN BLINDS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Horizontal slat venetian blinds.
- B. Operating hardware.

#### 1.02 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating physical and dimensional characteristics.
- C. Samples: Submit two samples, 12 inch long illustrating slat materials and finish, color, cord type and color.
- D. Manufacturer's Installation Instructions: Indicate special procedures.

#### 1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

#### 1.04 PROJECT CONDITIONS

- A. Coordinate the work with window installation and placement of concealed blocking to support blinds.
- B. Take field measurements to determine sizes required.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Horizontal Slat Venetian Blinds:
  - 1. Hunter Douglas.
  - 2. Levolor Home Fashions Contract Div.
  - 3. Substitutions: See Section 01600 - Product Requirements.

#### 2.02 BLINDS AND BLIND COMPONENTS

- A. Blinds: Horizontal slat venetian blinds hung from full-width headrail with full-width bottom rail; manual control of raising and lowering by cord with full range locking; blade angle adjustable by cord.
- B. Metal Slats: Spring tempered pre-finished aluminum; square slat corners, with manufacturing burrs removed.
  - 1. Width: 1/2 inch.
  - 2. Thickness: 0.011 inch.
  - 3. Color: As selected.
- C. Slat Support: Woven polypropylene cord, ladder configuration.
- D. Head Rail: Pre-finished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats

- E. Bottom Rail: Pre-finished, formed aluminum with top side shaped to match slat curvature; with end caps. Color: Same as headrail.
- F. Lift Cord: Braided nylon; continuous loop.
- G. Control Wand: Extruded hollow plastic; square shape.
  - 1. Non-removable type.
  - 2. Length of window opening height less 3 inches.
- H. Headrail Attachment: As recommended by the blind manufacturer.
- I. Accessory Hardware: Type recommended by blind manufacturer.

### 2.03 FABRICATION

- A. Fabricate blinds to fit within openings with uniform edge clearance of 1/4 inch.
- B. Fabricate blinds to cover window frames completely.
- C. At openings requiring multiple blind units, provide separate blind assemblies with space of 1/4 inch between blinds, located at window mullion centers.
- D. Fabricate blinds to maximum length of 4'-0".

## **PART 3 EXECUTION**

### 3.01 EXAMINATION

- A. Verify that openings are ready to receive the work.
- B. Ensure structural blocking and supports are correctly placed.

### 3.02 INSTALLATION

- A. Install blinds in accordance with manufacturer's instructions.
- B. Secure in place with flush countersunk fasteners.

### 3.03 ADJUSTING

- A. Adjust blinds for smooth operation.

### 3.04 CLEANING

- A. Clean blind surfaces just prior to occupancy.

### 3.05 SCHEDULE

- A. General: Provide blinds in all exterior window openings as follows:
  - 1. Office 121
  - 2. Office 123.
  - 3. Green Room 139.
  - 4. Office 148.

**END OF SECTION**

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## SECTION 12 496 - WINDOW SHADE SYSTEMS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Manually-operated window shades and accessories for sun/glare/heat control and room darkening.

#### 1.02 REFERENCES

- A. ASTM - E-84-90 Flame Spread Test
- B. Federal Specification CCC-C-521E - Fire Retardancy Testing.
- C. National Fire Protection Association (NFPA) 701 - Small-scale requirements.

#### 1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's catalog data, product descriptions, installation instructions, detail sheets, and specifications for each type system specified.
- C. Shade Samples for Selection: Manufacturer's color chart or sample set showing full range of shading and color options.
- D. Shop Drawings: Prepared specifically for this project; show dimensions and interface with other products.
  - 1. Room schedule including field-verified dimensions of each opening to receive window shade systems.
  - 2. Indicate System Series, operator, fabric selection, and mounting type.
  - 3. Indicate control type.

#### 1.04 QUALITY ASSURANCE

- A. Installer: Approved by manufacturer.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in manufacturer's original cartons.
- B. Individually package and mark shades with room number and opening number.
- C. Inspect the materials upon delivery to assure that specified products have been received.
- D. Store and handle shades to prevent damage to fabrics, finishes, and operators prior to installation.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Basis of Design Manufacturer: MechoShade Systems, Inc.; Long Island City, NY 11101.
- B. Substitutions: See Section 01600 - Product Requirements.
- C. Provide all window shade systems from a single manufacturer.

2.02 MANUFACTURED UNITS

- A. Mecho/3 Shade System, manually operated units, in manufacturer' s standard painted steel finish.

2.03 MANUAL SHADE SYSTEM

- A. Provide a pre-engineered unit with one-piece molded sprockets and a linear disc brake opposed to a flat steel backing plate and concealed variable adjustment mechanism. Shade mechanism shall be adjustable from 100% friction (static mode) with infinite positions to 15% friction (dynamic mode) with only pre-selected positions. The operator shall be a side-mounted gear and sprocket mechanism located within the drive-end bracket.

2.04 FABRICS

- A. Provide sunscreen cloth from single source. Shade cloth seconds or shade cloth manufacturers using reprocessed materials are not acceptable.
- B. Sunscreen Cloth: Provide a single sunscreen shadeband as selected by the Architect from manufacturer's standard fabric colors and weaves.

2.05 COMPONENTS

- A. Mounting Brackets: Stamped steel, custom fabricated as required for ceiling mounting.
- B. Side Channels: Custom extruded of 6063-T5 aluminum, 0.062 inch minimum wall.
  - 1. Size: 1-1/2 inches wide.
- C. Chain Hold-down: Provide spring tension pulley and shock absorber.

**PART 3 EXECUTION**

3.01 INSTALLATION

- A. Install window shade systems in accordance with manufacturer's instructions and these specifications.
- B. Assume responsibility for all field dimensions and mounting surfaces.
- C. Adjust window shade systems for proper operation.

3.02 SCHEDULE

- A. General: Provide window shades in all exterior window openings as follows:
  - 1. Gallery 103

**END OF SECTION**

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## SECTION 15 010 - MECHANICAL GENERAL

### PART 1 GENERAL

#### 1.01 GENERAL REQUIREMENTS

- A. General Conditions: Refer to the General Conditions, the Supplementary General Conditions and the Special Conditions, all provisions of which apply to work under this section as if written in full herein.
- B. The scope of work described in these Specifications and/or indicated on the drawings shall include (except where otherwise noted) the furnishing of all materials, equipment, appurtenances, accessories, connections, labor, etc. required and/or necessary to completely install, clean, inspect, adjust, test, balance and leave in safe and proper operating condition all mechanical systems. All mechanical work shall be accomplished by workmen skilled in the various trades involved.

#### 1.02 MECHANICAL BASE BID AND ALTERNATE

- A. The base bid is the work contained in the drawings M-0, M-1, M-2, M-3, M-4 and M-5 and as specified and omitting Section 15 020 (Alternate) Ductwork & Accessories, Section 15 150 (Alternate) Automatic Controls including Alternate Points List Schedule.
- B. The Alternate bid is the work contained in the drawings M-0A, M-1A, M-2A, M-3A, M-4A and M-5A and as specified and omitting specification Section 15 020 Ductwork & Accessories, 15 035 Pumps, 15 117 Packaged Air-Cooled Chiller, Section 15 150 Automatic Controls including Points List Schedule and Section 15 867 Modular Central Station Air Handling Units.

#### 1.03 ORDINANCES AND PERMITS

- A. All HVAC work shall conform to all ordinances and regulations of the City, County, State and/or other authorities having jurisdiction.
- B. If code or other requirements exceed the provisions shown on the contract documents, the Engineer shall be notified in writing. Where requirements of the contract documents exceed code requirements, work shall be furnished and installed in accordance with the contract documents. Any work done contrary to these requirements shall be removed and replaced at the Contractor's expense.
- C. Contractor shall obtain all permits and inspections required for the installation of this work and pay all charges incident thereto. He shall deliver to the Architect all certificates of said inspection.
- d. The contractor shall pay all utility tie-in fees.

#### 1.04 EQUIPMENT, MATERIALS, BID BASIS

- A. Manufacturers' names, model numbers, etc. as specified on the drawings and herein are for the purpose of describing type, capacity, function and quality of equipment and materials required.
- B. Unless "approved equal" is specifically stated, bids shall be based on equipment named in specifications or on drawings as "base" products.
- C. "Equal product" and "approved equal" items listed shall conform to specified base items and shall be

substantially equal in size, weight, construction and capacities. The alternate equipment and materials shall be submitted as full equivalent to the equipment and materials specified, with sufficient supportive documentation and technical literature to demonstrate quality, performance, and workmanship without doubt or question. The Engineer shall consider the use of the alternate equipment based on the supportive documentation available to him, and shall approve or disapprove any proposed alternates. The decision of the Engineer shall in all cases be final.

- D. The contractor shall coordinate the installation of all mechanical equipment proposed for use in this project with all building trades (architectural, structural and electrical). Coordination shall be accomplished prior to, and shall be reflected in, the submittal of shop drawings for approval. Any modifications or revisions required by other trades as a result of the use of equipment other than the basis of design shall be made at no additional cost.

#### 1.05 EXAMINATION OF PREMISES

- A. Prior to the ordering or purchasing of any equipment or materials or the layout or installation of any work, the Contractor shall examine the premises and verify any and all of the existing conditions under which he will be obliged to operate, or that will in any manner affect the work under this contract. No allowance will be made subsequently in this connection in behalf of the Contractor.

#### 1.06 EXISTING SERVICES

- A. Active Services: When encountered in work, protect, brace, support existing active sewers, gas and other services required for proper execution of work. If existing active services are encountered that require relocation, relocate as approved. Do not prevent or disturb operation of active services that are to remain.
- B. Inactive Services: When encountered in work, remove, cap or plug inactive services. Notify utility companies or municipal agencies having jurisdiction. Protect or remove these services as directed.
- C. Interruption of Services: Where work makes temporary shut down of services unavoidable, shut down at night, or at such times as approved by Owner, which will cause least interference with established operating routine. Arrange work to assure that services will be shut down only during time actually required to make connection to existing work.
- D. Existing ductwork, pipe, insulation, or other material removed or damaged during the work shall be replaced as specified for new work.

#### 1.07 INSTRUCTIONS & DIAGRAMS

- A. Contractor shall prepare three (3) instruction manuals describing installation, operation and maintenance of all HVAC equipment. Manuals shall include copies of control schematics and sequences involved in these operations and indicate the function and operations of all components, as well as the Contractor's name, address, and telephone number. Manuals shall also contain one copy of all manufacturers' drawings, pamphlets, data, parts lists, instructions and manuals of equipment. One copy shall be delivered to the Owner, one copy shall be placed in Instruction Box. The pamphlets and drawings are to be neatly bound in a plastic binder.
- B. Also upon completion of the work, the Contractor shall conduct operation and training session(s) for the Owner's key operating personnel. These sessions shall be of sufficient length and duration to adequately

explain the design intent and proper operating and maintenance techniques for all mechanical equipment and systems. After these sessions are completed, the Contractor shall provide a copy of a signed statement by the Owner that his personnel are thoroughly familiar with and capable of operating all mechanical equipment and systems.

#### 1.08 COORDINATION DRAWINGS

- A. The contractor shall prepare, and obtain Engineer's approval of coordinated MEP color drawings prior to submitting shop fabrication drawings. Drawings shall be drawn at a minimum of 1/4" scale and clearly show location of all work (ductwork, grilles, mechanical equipment, structural members, ceiling heights, domestic piping, process piping, sprinkler piping, sprinkler heads, lights, conduits, J-boxes, speakers, etc.) involved in the ceiling plenum space. Sections and elevations shall be drawn to further clarify special conditions that may exist. Drawings shall clearly indicate the installed elevations of all work.
- B. Once all work has been presented on the drawings, all trades shall meet to resolve conflicts in plenum area. If an area of conflict can not be resolved to either parties satisfaction, the area of dispute shall be reviewed by the Architect/Engineer for final resolution.
- C. Upon completion of the coordination process, a revised color drawing shall be signed off on by all trades that the drawings are free of installation conflicts and submitted to the Architect/Engineer. The color prints will remain with the Architect/Engineer for record purposes. Once reviewed by the Architect/Engineer, a letter of approval will be issued.

#### 1.09 SHOP DRAWINGS

- A. The Contractor shall prepare, submit, and obtain Engineer's approval of manufacturers' shop drawings on the following equipment and systems prior to ordering, purchasing, or installing any equipment or materials:
  - 1. All equipment scheduled on the drawings.
  - 2. Valves.
  - 3. Control equipment, systems and diagrams.
  - 4. Insulation and lining.
  - 5. Ductwork drawings drawn to not less than 1/8 scale, double line, showing all fittings, offsets, etc. required for the installation.
  - 6. Flexible ductwork.
  - 7. Grilles, registers and diffusers.
  - 8. Dampers.
  - 9. Piping drawings drawn to not less than 1/8" scale (or larger if shown on the contract drawings) showing all fittings, valves, offsets, etc. required for the installation.
  - 10. Pipe and piping accessories (gauges, hangers, thermometers, etc.)
  - 11. Roof curbs. (Refer to Architectural Division 7 for specification.) Note: All references to roof curb heights on the contract drawings and/or contained herein are heights above the exterior roof surface. Contractor shall coordinate roof curb sizes with roof system type and insulation thicknesses to maintain a minimum roof curb height of 12" above roof surface or greater if specified in these contract documents.
  - 12. Energy management system. (Automatic Controls).
- B. All shop drawing approvals required by any code or enforcement authority, insurance underwriter, etc. shall be obtained prior to being submitted to the Engineer.
- C. Review of shop drawings by the Engineer does not relieve the Contractor from responsibility for complying

with all requirements of the Contract Documents. Furthermore, it shall be the responsibility of the Contractor to coordinate the requirements (roof openings, wall openings, curbs, electrical, etc.) of all approved equipment with the other trades and disciplines at no additional cost.

- D. All shop drawings shall be identified by the equipment mark or tag identification numbers shown on the contract drawings.
- E. Submit shop drawings for approval in accordance with the requirements of Division 1 of these specifications. Shop drawings shall be bound into three ring binders, with each volume containing one copy of all shop drawings. HVAC and plumbing submittal shall be bound into separate binders. All shop drawings shall be submitted simultaneously. Shop drawings will not be reviewed until all have been submitted except shop drawings for ductwork and controls, which may be submitted after approval of equipment submittals. Each individual submittal item shall be marked to show which specification section pertains to the item.
- F. All shop drawings shall clearly state that the electrical characteristics of all equipment has been coordinated with the electrical contract documents and the electrical contractor.

#### 1.10 PAINTING

- A. Painting, except as otherwise specified, will be done under another section of the specifications, but Contractor shall leave all surfaces of work free of rust, dirt and grease.
- B. Contractor shall touch-up to match original finish any equipment scratched in shipment or installation.
- C. Any visible ductwork through grilles, registers and diffusers shall be painted flat black.
- D. Provide one coat of rust preventive primer on all new structural steel supports and new ferrous surfaces not galvanized.

#### 1.11 RECORD DRAWINGS

- A. The Contractor shall maintain a record of all changes in the work from that shown in the contract documents. After all work is completed, the Contractor shall prepare a set of "as-built" reproducible drawings of similar type and quality as the contract drawings that reflect all changes and that accurately show actual final construction, and deliver these drawings to the Engineer.
- B. A copy of the General Contractor and all subcontractors for the project shall be mounted in a frame with a plastic cover on the wall of the main building mechanical room.
- C. A mechanical drawing showing control and HVAC component diagrams and schematics to include a schedule showing CFM, EADB/EAWB, LADB/LAWB updated by the mechanical engineer shall be mounted under transparent plastic cover in permanent, durable frames, on the mechanical room walls. Control sequence shall be on the drawing. Information shall be typed.
- D. All HVAC drawings shall include a control schematic, a sequence of operation, and a point check out sequence. The control drawings and the schematic shall be framed under glass to each mechanical equipment room.

#### 1.12 TRANSPORTATION, DELIVERY, STORAGE AND PROTECTION

- A. As part of the mechanical work, the Contractor shall provide and pay for all transportation, delivery, and storage required for all equipment and materials. Upon receipt of all equipment and materials, they shall be properly stored to protect them from vandalism, theft, the elements, and other harm or damage. Any equipment or materials received in a damaged condition, or damaged after receipt, shall not be installed. Only new undamaged equipment in first-class operating condition shall be installed.
- B. All equipment, piping and ductwork shall be protected to prevent entrance of foreign matter and debris by covering exposed openings during construction.
- C. The mechanical contractor shall closely coordinate the ordering and delivery of all mechanical equipment with other trades to assure that equipment will be delivered in time to be installed in the building without requiring special or temporary access or building modifications. Certain equipment may have to be installed prior to the erection of the building walls or roofs.

#### 1.13 GUARANTY

- A. All mechanical work described in the contract documents shall be guaranteed for a period of one year from the date of final acceptance or Owner occupancy, whichever comes first. This guaranty shall apply to all equipment, materials and workmanship. During the guaranty period, all defects in mechanical systems shall be corrected in an acceptable manner, consistent with the quality of materials and workmanship of original construction, at no expense to the Owner.
- B. All reciprocating and scroll air conditioning compressors shall have an additional 4 year parts warranty.

### **PART 2 PRODUCTS**

#### 2.01 GENERAL

- A. All equipment, materials, accessories, etc. used as part of the mechanical work shall be new, of the best grade and quality and of current production, unless specified otherwise. Equipment not specified in the contract documents shall be suitable for the intended use and shall be subject to approval by the Engineer.
- B. All equipment, products and materials shall be free of defects and shall be constructed to operate in a safe manner without excessive noise, vibration, leakage, or wear.
- C. Electric motors shall be high efficiency, drip-proof type unless otherwise specified. Motors shall meet Table MG-1-12C of EPACK '92.

#### 2.02 AIR FILTERS

- A. All filters shall be U.L. Class 2.
- B. Filters shall be pleated type (Farr 30/30) unless specified otherwise.
- C. Install one set of filters in unit during construction and a second set just prior to test and balance.

#### 2.03 ELECTRICAL WORK

- A. Except as otherwise specified or noted, electrical equipment shall be as specified herein.

- B. Motor controls, system controls, starters, pilot lights, push buttons, etc. shall be furnished by the Contractor complete as a part of the motor or apparatus which it operates. Electrical equipment shall be wired for the voltage, as shown on the Electrical Drawings.
- C. Motors shall be standard NEMA continuous duty type, and shall bear the U.L. label. Starter shall be minimum size 0, combination type (with disconnect and lockable handle) with molded case circuit breaker. Each motor shall have ample capacity to drive the equipment to which it is connected at its full load capacity without loading the motor beyond its nameplate ratings, and shall have overload protection. Motors shall meet Table MG-1-12C of EPACT 1992.
- D. Starters for motors 1/3 HP and smaller shall be manual for 1/2 HP and larger, magnetic. Starters for motors with remote or automatic control shall be magnetic. Relays, interlocks and auxiliary contacts shall be provided as specified and required.
- E. Magnetic motor starters shall be across-the-line, full voltage, non-reversing type unless otherwise indicated on the drawings or specified herein. Phase loss protection shall be provided as indicated on drawings.
- F. Motor controls shall be either "Hand-Off-Auto" switches or "On-Off" push buttons with one indicating light. "Hand-Off-Auto" switches shall be provided for automatically controlled apparatus.
- G. Motor starters not an integral part of equipment shall be installed under the Electrical Specifications.
- H. Electrical power wiring to disconnects, starters, motors and similar devices shall be provided under the Electrical Section. All mechanical equipment requiring electrical power shall be installed with disconnect switches at each piece of equipment. Coordinate switch type (fused or non-fused) with equipment characteristics, manufacturer's recommendations and electrical drawings.
- I. Contractor shall provide all system controls, line and low voltage control and interlock wiring in conduits in accordance with materials and installation requirements of Electrical Section. All starters shall be labeled on face of starter.
- J. All starters for three-phase equipment shall have overload devices in all three (3) phases.
- K. Wiring diagrams shall be furnished by this Contractor.
- L. Acceptable manufacturers shall be General Electric, Square D, Cutler-Hammer, Siemens and Allen Bradley.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION - GENERAL**

- A. All equipment and materials shall be completely installed and adjusted, complete with all accessories and connections.
- B. Equipment, piping, ductwork, etc. shall fit into the spaces provided in the building and shall be installed at such times and in such a manner as to avoid damage to the building and as required by the job progress. Contractor shall coordinate work with other trades and locate work described herein to avoid interferences with structural, electrical and architectural work. Equipment, accessories and similar items requiring

normal servicing or maintenance shall be easily accessible.

- C. Contractor shall coordinate work so that structural work is properly installed to accommodate work under these sections.
- D. Installation shall be in accordance with ASHRAE Guide and manufacturers' recommendations.
- E. The Architect reserves the right to direct the removal of any item which, in his opinion, does not present an orderly and reasonably neat or workmanlike appearance. Such removal and replacement shall be done when directed by the Architect, at the Contractor's expense, and without additional cost to the Owner.

### 3.02 EQUIPMENT SUPPORT

- A. Major equipment supports (framed structural openings, etc.) shall be furnished and installed by others as shown on the drawings. The mechanical work shall include, however, the furnishings and installation of all miscellaneous equipment supports, structural members, rods, clamps and hangers required to provide adequate support of all mechanical equipment.
- B. Unless otherwise shown on the drawings, all mechanical equipment, piping, and accessories shall be installed level, square, and plumb.
- C. All equipment, piping, etc. supported by structural joists shall be supported by the top chord only of such joists. Hangers shall not be attached to the bottom chord of any joists.

### 3.03 PIPE AND DUCTWORK PENETRATIONS

- A. Sleeves shall be installed in all masonry or concrete walls, floors, roofs, etc. for pipe and ductwork penetrations. Sleeves for pipe shall be schedule 40 black steel. Sleeves for ductwork shall be 20 gauge galvanized steel. Sleeves shall be sized to provide a minimum of 1/4" clearance between the sleeve and pipe or duct. For insulated pipes or ducts, the clearance shall be between the sleeve and the insulation.
- B. As far as possible, all pipe and ductwork penetrations shall be provided for at the time of masonry or concrete construction. Where drilling is required, only core drills shall be used. Star drills shall not be used.
- C. All pipes penetrating walls or floors of any construction shall be installed with escutcheon plates on both sides of the penetration securely fastened to the wall or floor. In exposed areas, escutcheon plates shall be chrome plated. All escutcheon plates shall be sized to completely conceal the penetration.
- D. Ductwork penetrating walls or floors of any material shall be installed with closure plates on both sides of the penetration. Penetrations through exterior walls shall be sealed weathertight.

### 3.04 CUTTING AND PATCHING

- A. The mechanical work shall include all cutting, patching, masonry and carpentry work required as part of the equipment installation when not provided by other sections of these specifications.
- B. All work shall be performed as specified under Architectural specification section for cutting and patching.

### 3.05 TRENCHING AND BACKFILLING

- A. Trenching and backfilling required for the routing of piping shall be a part of the mechanical work and shall be performed as described in other sections of these specifications.

### 3.06 CLEANING

- A. At all times, the premises shall be kept reasonably clean and free of undue amounts of waste, trash and debris by periodic cleaning and removal. After completion, all foreign material, trash and other debris shall be removed from the job site.
- B. After all equipment has been installed, but prior to testing and balancing, all equipment, piping, ductwork, etc. shall be thoroughly cleaned both inside and out.
- C. Filters shall then be installed where required, and all systems shall be tested and balanced.
- D. After testing and balancing and just prior to Owner review and acceptance, all systems shall be finally cleaned and shall be left ready for use.
- E. All water piping shall be cleaned and disinfected as required by Code.

### 3.07 PAINTING AND COATING

- A. Unless otherwise specified herein or shown on the drawings, general painting of mechanical equipment shall be by others.
- B. Touch-up painting of mechanical equipment shall be part of the mechanical work. All equipment and materials that are painted or coated by the manufacturer shall be touched-up prior to completion to conceal any and all scratches or other finish irregularities and to maintain the integrity of the paint or coating.

All painting and coating shall match the original and shall conform to the requirements detailed in other sections of these specifications.

### 3.08 FLASHING

- A. All piping and ductwork penetrating roofs shall be flashed in an approved manner, shall be watertight, and shall conform to the requirements detailed in other sections of these specifications.
- B. Flashing for piping shall be sheet lead of not less than 6 pounds per square foot, shall have a base not less than two (2) square feet, and shall extend up over and into the open end of the pipe. All flashing shall be properly caulked and sealed.

### 3.09 EQUIPMENT LABELING

- A. All mechanical equipment shall be labeled. This shall include all central plant, air handling or air conditioning equipment, air terminals, and other similar and miscellaneous equipment.
- B. Labels for air terminals or other devices shall be located for optimum visibility through access panel or removed ceiling tiles.
- C. Equipment labeling shall be one of the following, unless noted or specified otherwise.

1. Permanently attached plastic laminated signs with 1" high lettering.
2. Stencil painted identification, 2" high letters, with standard fiberboard stencils and standard black (or other appropriate color) exterior stencil enamel.

**END OF SECTION**



**SECTION 15020**

**DUCTWORK & ACCESSORIES**

**PART 1 GENERAL**

1.01 DESCRIPTION

- A. Furnish and install all material, labor, accessories, etc. shown on the drawings and as specified herein to completely install all ductwork systems.
- B. Ductwork systems shall be classified as follows:
  - 1. Low pressure (less than 2" w.c.) AHU-1: from terminal units to supply diffusers, and all return and exhaust ductwork. All supply and return ductwork from AHU-2 and AH-3.
  - 2. Medium pressure (maximum 6" w.c.) - from air handling unit AHU-1 to PIU/VAV terminal units.
- C. Ductwork shall be constructed according to the latest edition of SMACNA ductwork construction standards applicable to the system pressures described above, and the system material construction.
- D. Duct sizes shown on the drawings are nominal inside clear.

**PART 2 PRODUCTS**

2.01 DUCTWORK

- A. All ductwork shall be constructed of galvanized steel sheets of the thickness listed in the SMACNA manuals referenced above.

2.02 FIRE DAMPERS

- A. Type B or C fire dampers with the blade stack out of the airstream shall be installed at all locations where ductwork penetrates any floor, wall or partition with a fire rating of 1 hour or more or where otherwise shown on the drawings. Fire dampers shall have a rating compatible with the floor, wall or partition, and shall be U.L. 555 rated. Type A fire dampers with the blade stack in the airstream may be used behind grilles or where space conditions do not permit the use of a Type B damper.
- B. All fire dampers shall be of the "Dynamic" type as classified in U.L. Standard 555.
- C. Slab, Wall and Partition Dampers:
  - 1. Dampers shall be factory built curtain type. They shall conform to the requirements of NFPA Standard 90 and be U.L. labeled for the required rating (1-1/2 hours minimum).
  - 2. Provide factory built sleeves of design and length to permit mounting within the opening.
  - 3. All dampers shall be installed in strict accordance with the manufacturer's U.L. approved installation.
  - 4. Where fire dampers are shown on the drawings, and if fiberglass ductwork is used, dampers shall be installed in sheet metal duct extending on both sides of the partition as required by governing code authorities.

2.03 FLEX DUCT CONNECTORS

- A. Install flex duct connectors at connections of sheet metal duct to motor driven equipment, or otherwise noted. Flex duct connectors shall be glass fabric coated with neoprene, suitable for service. Install per manufacturer's instructions, and support sheet metal ductwork so that no weight is supported by flex duct connector.
- B. Flex duct connectors shall also be provided at building expansion joints.

#### 2.04 ACCESS DOORS

- A. Hinged, gasketed and latched access doors and/or panels shall be installed at each fire and smoke damper, each duct mounted smoke detector, each valve, at each duct mounted balancing damper or any other mechanical equipment or device that requires accessibility. Doors and panels shall be sized and located to optimize access to dampers, detectors, and other equipment for service and replacement. Access doors in ductwork shall be per SMACNA Standards. Access doors and panels in walls, ceilings or other surfaces shall be coordinated with architectural finishes, and shall be as manufactured by Cesco Products.

#### 2.05 FLEXIBLE DUCTWORK

- A. Flexible ductwork shall be U.L. Class I air duct.
- B. Flexible ductwork maximum 8'-0" long shall be installed between main supply ducts and diffusers. Take-off's shall be made using spin-in type fittings with extractor and balancing damper, Flexmaster type "FLDE" or equal. Flexible ductwork shall be Flexmaster type 3 flexible duct or equal. Duct size shall be the same size as diffuser neck it serves.

#### 2.06 AUTOMATIC CONTROL DAMPERS

- A. Automatic control dampers shall be installed as shown on the drawings and shall be controlled as described in the Automatic Controls section of these specifications.
- B. Dampers shall be of the opposed blade type constructed of minimum 18 gauge galvanized steel and shall have rigidly constructed blades less than 6" wide, and shall have duct mounting flanges.
- C. Dampers shall be of the low leakage type with replaceable blade and jamb seals. Damper leakage shall not exceed 6 cfm per sq. ft. of damper area at 4 in. w.c.

#### 2.07 DUCT INSULATION

- A. Refer to Section 15170 - HVAC Insulation for duct insulation.
- B. Supply air ductwork a minimum of 10 lineal feet downstream of terminal units shall be internally lined with 1" thick, 3 lb/ft<sup>3</sup> acoustical duct liner, Certainteed "Toughgard" or approved equal. Also, all supply and return ductwork serving the seating and stage areas shall be lined with 1" thick, 3lb/ft<sup>3</sup> acoustical duct liner, Certainteed "Toughgard" or equal.
  - 1. Duct liner shall be securely fastened to ductwork with stick pins with speed washers and adhesive. Leading edges of liner in medium pressure ductwork shall have a sheetmetal nosing.
- C. Supply air ductwork a minimum of 50 lineal feet (or as indicated) downstream of medium pressure air handling unit AHU-1. Equipment shall be internally lined with 1" thick, 3 lb/ft<sup>3</sup> acoustical duct liner, Certainteed "Toughgard" or approved equal.

- D. Return air ductwork and transfer ducts serving the Lobby, Public and Support areas shall have 1" thick, 1 1/2 lb/ft<sup>3</sup> duct liner, Certaineed "Toughgard" or approved equal.

#### 2.08 SMOKE DAMPERS

- A. Smoke dampers with airfoil shaped blades shall be installed at all locations where ductwork or supply or return air openings penetrate any floor, wall or partition with a smoke rating, or where otherwise shown on the drawings, except where such ductwork or openings are part of an engineered smoke removal system. Smoke dampers shall have a rating compatible with the floor, wall, or partition, and shall be U.L. rated, Class I.
- B. Smoke dampers shall be provided with actuators capable of closing the damper on activation of area smoke detectors or fire alarm system, and shall be normally closed. Wiring of actuators shall be by the mechanical contractor. Actuators shall be compatible with activating smoke detectors or fire alarm system (coordinate with other trades).

### PART 3 EXECUTION

#### 3.01 DUCTWORK

- A. All ductwork shall be installed in accordance with applicable SMACNA Standards according to the pressure class described in PART ONE - GENERAL.
- B. Ductwork shall be supported as recommended by SMACNA Standards from structural members. Ductwork shall not be allowed to rest on ceilings, light fixtures or structural members. Ductwork supported from joists shall be supported from the top chord of all joists.
- C. All ductwork accessories shall be installed in strict accordance with manufacturer's recommendations.
- D. All ductwork shall be leak tested in accordance with SMACNA Standards. All ductwork seams shall be sealed with mastic to provide a system that is within the allowable SMACNA leakage limits. Six copies of the ductwork test report shall be submitted to the Engineer prior to the Contractor's request for final payment.
- E. All ductwork shall be cleaned inside and out prior to system start up, and shall be left in a neat and orderly manner.
- F. Ducts, unless otherwise approved, shall be true to dimensions indicated, straight and smooth on inside with neatly finished joints; securely anchor to building in an approved manner, and install to be completely free from vibration under all conditions of operation. Exact routing of ductwork will be dependent on location of framing members. Route duct to avoid cutting framing members. Duct sizes shown on drawings are inside clear dimensions.
- G. Brace ducts not more than 60 inches on center. Make slip joints in direction of flow. Unless otherwise indicated, elbows shall have a centerline radius of not less than 1-1/2 times width of duct. Where space limitations necessitate use of short radius or square elbows, install turning vanes. Offset ducts around obstructions where possible. Where duct must encompass obstruction, area of duct shall remain constant. Duct tapers shall not exceed 1:4 ratio and transformations 30 degrees between air flow and diverging or converging air flow. Provide access doors for access to all equipment, dampers and motors concealed by sheet metal.

3.02 DAMPERS

- A. Install dampers where indicated on drawings. Provide friction damper behind face of each supply outlet which shall be adjustable by removal of supply.

3.03 START UP, BALANCING AND OPERATING TESTS

- A. Contractor shall be responsible for initial start up of system, adjusting all air flow devices to insure proper air quantities and patterns and proper thermostat operation. Clean duct interior before start up. Systems shall not be operated at any time unless filters are in place. Operate systems for a period of not less than 24 hours during which time system shall be completely tested for leaks and malfunctions; check pressure to assure compliance with manufacturer's instructions. During this test demonstrate to Architect that all parts are installed correctly and operating properly. If a system has lost any refrigerant charge during period between completion of installation and start up, find and repair leak, evacuate and recharge entire system.
- B. Balance air supply system to provide air quantities indicated and until even temperatures exist throughout building. Record air quantity in CFM passing through each supply and return register or grille and entire system. Satisfactory operations of all conditioning control and safety controls, voltmeter and ammeter readings of compressor and circulating blower motors shall be checked and recorded. Furnish all instruments, test equipment and personnel required for tests.

**END OF SECTION**

**SECTION 15 020 - (ALTERNATE) DUCTWORK & ACCESSORIES**

**PART 1 GENERAL**

1.01 DESCRIPTION

- A. Furnish and install all material, labor, accessories, etc. shown on the drawings and as specified herein to completely install all ductwork systems.
- B. Ductwork systems shall be classified as follows:
  - 1. Low pressure (less than 2" w.c.) RTU-1: from terminal units to supply diffusers, and all return and exhaust ductwork. All supply and return ductwork from RTU-2 and RTU-3.
  - 2. Medium pressure (maximum 6" w.c.) - from air handling unit RTU-1 to PIU/VAV terminal units.
- C. Ductwork shall be constructed according to the latest edition of SMACNA ductwork construction standards applicable to the system pressures described above, and the system material construction.
- D. Duct sizes shown on the drawings are nominal inside clear.

**PART 2 PRODUCTS**

2.01 DUCTWORK

- A. All ductwork shall be constructed of galvanized steel sheets of the thickness listed in the SMACNA manuals referenced above.

2.02 FIRE DAMPERS

- A. Type B or C fire dampers with the blade stack out of the airstream shall be installed at all locations where ductwork penetrates any floor, wall or partition with a fire rating of 1 hour or more or where otherwise shown on the drawings. Fire dampers shall have a rating compatible with the floor, wall or partition, and shall be U.L. 555 rated. Type A fire dampers with the blade stack in the airstream may be used behind grilles or where space conditions do not permit the use of a Type B damper.
- B. All fire dampers shall be of the "Dynamic" type as classified in U.L. Standard 555.
- C. Slab, Wall and Partition Dampers:
  - 1. Dampers shall be factory built curtain type. They shall conform to the requirements of NFPA Standard 90 and be U.L. labeled for the required rating (1-1/2 hours minimum).
  - 2. Provide factory built sleeves of design and length to permit mounting within the opening.
  - 3. All dampers shall be installed in strict accordance with the manufacturer's U.L. approved installation.
  - 4. Where fire dampers are shown on the drawings, and if fiberglass ductwork is used, dampers shall be installed in sheet metal duct extending on both sides of the partition as required by governing code authorities.

2.03 FLEX DUCT CONNECTORS

- A. Install flex duct connectors at connections of sheet metal duct to motor driven equipment, or otherwise noted. Flex duct connectors shall be glass fabric coated with neoprene, suitable for service. Install per manufacturer's instructions, and support sheet metal ductwork so that no weight is supported by flex duct connector.

- B. Flex duct connectors shall also be provided at building expansion joints.

#### 2.04 ACCESS DOORS

- A. Hinged, gasketed and latched access doors and/or panels shall be installed at each fire and smoke damper, each duct mounted smoke detector, each valve, at each duct mounted balancing damper or any other mechanical equipment or device that requires accessibility. Doors and panels shall be sized and located to optimize access to dampers, detectors, and other equipment for service and replacement. Access doors in ductwork shall be per SMACNA Standards. Access doors and panels in walls, ceilings or other surfaces shall be coordinated with architectural finishes, and shall be as manufactured by Cesco Products.

#### 2.05 FLEXIBLE DUCTWORK

- A. Flexible ductwork shall be U.L. Class I air duct.
- B. Flexible ductwork maximum 8-0" long shall be installed between main supply ducts and diffusers. Take-off's shall be made using spin-in type fittings with extractor and balancing damper, Flexmaster type "FLDE" or equal. Flexible ductwork shall be Flexmaster type 3 flexible duct or equal. Duct size shall be the same size as diffuser neck it serves.

#### 2.06 AUTOMATIC CONTROL DAMPERS

- A. Automatic control dampers shall be installed as shown on the drawings and shall be controlled as described in the Automatic Controls section of these specifications.
- B. Dampers shall be of the opposed blade type constructed of minimum 18 gauge galvanized steel and shall have rigidly constructed blades less than 6" wide, and shall have duct mounting flanges.
- C. Dampers shall be of the low leakage type with replaceable blade and jamb seals. Damper leakage shall not exceed 6 cfm per sq. ft. of damper area at 4 in. w.c.

#### 2.07 DUCT INSULATION

- A. Refer to Section 15170 - HVAC Insulation for duct insulation.
- B. Supply air ductwork a minimum of 10 lineal feet downstream of terminal units shall be internally lined with 1" thick, 3 lb/ft<sup>3</sup> acoustical duct liner, Certaineed "Toughgard" or approved equal. Also, all supply and return ductwork serving the seating and stage areas shall be lined with 1" thick, 3lb/ft<sup>3</sup> acoustical duct liner, Certaineed "Toughgard" or equal.
  - 1. Duct liner shall be securely fastened to ductwork with stick pins with speed washers and adhesive. Leading edges of liner in medium pressure ductwork shall have a sheetmetal nosing.
- C. Supply air ductwork a minimum of 50 lineal feet (or as indicated) downstream of medium pressure air handling unit RTU-1. Equipment shall be internally lined with 1" thick, 3 lb/ft<sup>3</sup> acoustical duct liner, Certaineed "Toughgard" or approved equal.
- D. Return air ductwork and transfer ducts serving the Lobby, Public and Support areas shall have 1" thick, 1 1/2 lb/ft<sup>3</sup> duct liner, Certaineed "Toughgard" or approved equal.

#### 2.08 SMOKE DAMPERS

- A. Smoke dampers with airfoil shaped blades shall be installed at all locations where ductwork or supply or return air openings penetrate any floor, wall or partition with a smoke rating, or where otherwise shown on the drawings, except where such ductwork or openings are part of an engineered smoke removal system. Smoke dampers shall have a rating compatible with the floor, wall, or partition, and shall be U.L. rated, Class I.
- B. Smoke dampers shall be provided with actuators capable of closing the damper on activation of area smoke detectors or fire alarm system, and shall be normally closed. Wiring of actuators shall be by the mechanical contractor. Actuators shall be compatible with activating smoke detectors or fire alarm system (coordinate with other trades).

### PART 3 EXECUTION

#### 3.01 DUCTWORK

- A. All ductwork shall be installed in accordance with applicable SMACNA Standards according to the pressure class described in PART ONE - GENERAL.
- B. Ductwork shall be supported as recommended by SMACNA Standards from structural members. Ductwork shall not be allowed to rest on ceilings, light fixtures or structural members. Ductwork supported from joists shall be supported from the top chord of all joists.
- C. All ductwork accessories shall be installed in strict accordance with manufacturer's recommendations.
- D. All ductwork shall be leak tested in accordance with SMACNA Standards. All ductwork seams shall be sealed with mastic to provide a system that is within the allowable SMACNA leakage limits. Six copies of the ductwork test report shall be submitted to the Engineer prior to the Contractor's request for final payment.
- E. All ductwork shall be cleaned inside and out prior to system start up, and shall be left in a neat and orderly manner.
- F. Ducts, unless otherwise approved, shall be true to dimensions indicated, straight and smooth on inside with neatly finished joints; securely anchor to building in an approved manner, and install to be completely free from vibration under all conditions of operation. Exact routing of ductwork will be dependent on location of framing members. Route duct to avoid cutting framing members. Duct sizes shown on drawings are inside clear dimensions.
- G. Brace ducts not more than 60 inches on center. Make slip joints in direction of flow. Unless otherwise indicated, elbows shall have a centerline radius of not less than 1-1/2 times width of duct. Where space limitations necessitate use of short radius or square elbows, install turning vanes. Offset ducts around obstructions where possible. Where duct must encompass obstruction, area of duct shall remain constant. Duct tapers shall not exceed 1:4 ratio and transformations 30 degrees between air flow and diverging or converging air flow. Provide access doors for access to all equipment, dampers and motors concealed by sheet metal.

#### 3.02 DAMPERS

- A. Install dampers where indicated on drawings. Provide friction damper behind face of each supply outlet which shall be adjustable by removal of supply.

**3.03 START UP, BALANCING AND OPERATING TESTS**

- A. Contractor shall be responsible for initial start up of system, adjusting all air flow devices to insure proper air quantities and patterns and proper thermostat operation. Clean duct interior before start up. Systems shall not be operated at any time unless filters are in place. Operate systems for a period of not less than 24 hours during which time system shall be completely tested for leaks and malfunctions; check pressure to assure compliance with manufacturer's instructions. During this test demonstrate to Architect that all parts are installed correctly and operating properly. If a system has lost any refrigerant charge during period between completion of installation and start up, find and repair leak, evacuate and recharge entire system.
  
- B. Balance air supply system to provide air quantities indicated and until even temperatures exist throughout building. Record air quantity in CFM passing through each supply and return register or grille and entire system. Satisfactory operations of all conditioning control and safety controls, voltmeter and ammeter readings of compressor and circulating blower motors shall be checked and recorded. Furnish all instruments, test equipment and personnel required for tests.

**END OF SECTION**

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## SECTION 15 030 - LOUVERS, GRILLES, REGISTERS AND DIFFUSERS

### PART 1 GENERAL

#### 1.01 DESCRIPTION

- A. Furnish and install all louvers, grilles, registers and diffusers of the size, type, capacity, and characteristics as shown on the equipment schedules and described herein.
- B. Equipment schedules and specifications are based on the one manufacturer listed in the schedule. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.

### PART 2 PRODUCTS

#### 2.01 LOUVERS

- A. Louver components (heads, jambs, sills, blades, etc.) shall be factory assembled by the manufacturer into a complete unit. Louver sizes too large for shipping shall be built-up by the Contractor from factory assembled louver sections to provide the overall sizes required.
- B. Louver design shall incorporate structural supports required to withstand a wind load of 20 lbs. per square foot.
- C. All louver performance data submitted for approval shall bear the AMCA Certified Ratings Seal for Air Performance and Water Penetration.
- D. All louvers shall have a standard factory applied finish coating with color selection made by the Architect at the time of shop drawing approval. Color charts shall be submitted with louver shop drawings.

#### 2.02 GRILLES, REGISTERS AND DIFFUSERS

- A. Units shall be of the type, size, and construction as scheduled on the drawings.
- B. Unless otherwise noted on the drawings, all units shall be supplied with a factory finish of white baked enamel.
- C. Grilles, registers and diffusers shall be ordered with borders compatible with the ceiling system type in which they are installed.
- D. Aluminum devices shall be used for all areas subject to excessive moisture or humidity (e.g. showers, pools, bathrooms, etc.).

### PART 3 EXECUTION

#### 3.01 LOUVERS

- A. Louvers shall be installed according to manufacturer's recommendations, and shall be caulked and sealed

at the frame and flanges to make the installation weatherproof.

- B. Combination louver dampers shall be installed with required damper operators and linkage mechanisms and shall be field adjusted for full opening/closure stroke. Louvers shall be interlocked with exhaust fans as scheduled on the drawings and as described in the Automatic Controls Section of these specifications.

### 3.02 GRILLES, REGISTERS AND DIFFUSERS

- A. All units located in ceiling tiles shall be centered or shall be on quarter points of 2 ft. x 2 ft. tiles.
- B. Where a line of sight allows the ductwork, wall or ceiling structure to be seen behind any units, such ductwork, wall or ceiling structure shall be painted with nonflammable flat black paint to minimize visibility.
- C. All units not installed on T-bar ceiling grids shall be securely fastened to adjacent structures.
- D. Where air distribution devices are installed in inaccessible ceilings, provide spin-in with scoop without volume damper. Provide opposed blade damper in neck of air distribution device with access to damper control through face.

**END OF SECTION**

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## SECTION 15 035 - PUMPS

### PART 1 GENERAL

#### 1.01 DESCRIPTION OF WORK

- A. Furnish and install all pumps of the size, type, capacity and characteristics as shown on the equipment schedules and described herein.
- B. Equipment schedules and specifications are based on the one manufacturer listed in the schedule. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.

#### 1.02 QUALITY ASSURANCE

- A. Manufacturers: Firm regularly engaged in manufacturer of general-use centrifugal pumps with characteristics, pipe sizes and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Manufacturers: Provide products produced by Bell & Gossett, Taco, Armstrong, Aurora or equal.
- C. Electrical Standards: Provide electrical motors and products which have been listed and labeled by Underwriter's Laboratories and comply with NEMA Standards.
- D. Certification, Pump Performance: Provide pumps whose performance, under specified conditions, is certified by the manufacturer.

#### 1.03 SUBMITTALS

- A. Submit manufacturer's data on pumps including but not limited to, pump characteristic performance curves, certified where indicated.

#### 1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver and store pump products in factory-wrapped packages which properly protect pumps against weather, dirt and damage.
- B. Handle pumps carefully to avoid damage to motors, components, enclosures and finish. Do not install damaged units; replace and return damaged units to pump manufacturer.

### PART 2 PRODUCTS

#### 2.01 PUMPS

- A. Provide electrical motor driven, split case, vertical inline type centrifugal pumps where indicated; base-mounted with single piece base. Equip with Class B insulated, quiet, drip-proof, ball bearing type motor of rotation speed, HP rating and power characteristics indicated (1750 RPM if not otherwise indicated); factory align and couple motor to pump. Provide pump rated for capacity, pressure and suction/discharge heads indicated. Provide pump shaft with mechanical assembly, rotary type seal rated for water temperature of 250 degrees F. Connect pump to motor with flexible self-aligning coupling or close couple. Equip pump with sleeve bearings and force-feed lubrication system; and protect pump shaft internally with bronze sleeves. Provide bearing bracket assemblies of the type which can be removed without disturbing piping or motor. Impellers to be of non-overloading type so motor nameplate HP will not be exceeded at any point on the pump curve. The diameter of the impeller shall not exceed 85% of casing accommodation. Casings shall have drilled and tapped vent, drain and gage openings.

## 2.02 MOTORS

- A. Motors shall be heavy duty, high efficiency open drip proof unless otherwise specified. Motors shall meet Table MG-1-12C of EPACK '92.
- B. Motors controlled by an adjustable frequency drive shall be compatible with the particular manufacturer's drive that is used.

## **PART 3 EXECUTION**

### 3.01 INSPECTION

- A. Installer must examine conditions under which pumps are to be installed and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

### 3.02 INSTALLATION OF PUMPS

- A. Install pumps where shown in accordance with manufacturer's written instructions, and with recognized industry practices, to ensure that pumps comply with requirements and serve intended purposes. Comply with NEMA Standards and requirements of NEC.
- B. Coordinate with other work (piping) as necessary to interface installation of pumps with piping and other components of water system.
- C. Check alignment and, where necessary (and possible), realign shafts of motors and pumps within tolerances recommended by manufacturer.
- D. Install units on pad mounts as shown; comply with manufacturer's indicated installation method, if any, and with 15-Series sections.

### 3.03 ELECTRICAL CONNECTIONS

- A. Ensure that pump units are wired properly, with rotation in direction indicated and intended for proper pump performance.
- B. Provide positive electrical pump and motor grounding.

3.04 FIELD QUALITY CONTROL

- A. Upon completion of installation of pump, and after motor has been energized with normal power source, bleed air from pump casing and test pump to demonstrate compliance with requirements. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

**END OF SECTION**



## SECTION 15 040 - UNITARY EXHAUST AND SUPPLY FANS AND VENTILATORS

### PART 1 GENERAL

#### 1.01 DESCRIPTION

- A. Furnish and install all unitary exhaust and supply fans and ventilators of the size, type, capacity and characteristics as shown on the equipment schedules and herein described.
- B. Equipment schedules and specifications are based on the one manufacturer listed on the schedule. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.

#### 1.02 MANUFACTURERS

- A. Firm regularly engaged in the manufacturer of general-use centrifugal fans with characteristics and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Manufacturers: Provide products produced by Penn, Greenheck, Carnes or equal.
- C. Electrical Standards: Provide electrical motors and products which have been listed and labeled by Underwriter's Laboratories and comply with NEMA Standards.
- D. Certification, Fan Performance: Provide fans whose performance, under specified conditions, is certified by the manufacturer.

### PART 2 PRODUCTS

#### 2.01 ROOF-MOUNTED FANS AND VENTILATORS

- A. All units shall be rigidly constructed of materials suitable for the intended service and shall be installed with all accessories listed on the drawings.
- B. Fans and ventilators shall be the products of an AMCA certified manufacturer and shall bear the AMCA label for air and sound.
- C. All roof mounted units shall be installed on factory supplied 12 inch high insulated roof curbs of the proper type, size and construction for proper mounting. Curbs shall account for all roof slopes and pitches so that the unit is installed level. Units shall be anchored to curbs by a minimum of two lag screws of adequate size on each side.
- D. Units shall be completely weatherproof for outdoor installation and shall contain internal vibration isolation to assure smooth and quiet performance.
- E. Unless otherwise specified or shown on the drawings, all units shall be installed complete with gravity backdraft dampers, birdscreens and disconnect switches.

- F. Fan wheels and blades shall be constructed of aluminum and shall be statically and dynamically balanced at the factory.

**2.02 CEILING-CENTRIFUGAL AND CABINET FANS**

- A. Units shall be direct-drive type with backdraft damper, acoustically insulated cabinets and speed controller.

**PART 3 EXECUTION**

**3.01 GENERAL**

- A. All units shall be installed in accordance with manufacturer's recommendations and as shown on the drawings.
- B. Ceiling-centrifugal and cabinet fans shall be supported from structural members and shall not rest on ceiling, lights or structural members.
- C. Units shall be interlocked and controlled as shown on the drawings and as specified in the Automatic Controls section of these specifications and as scheduled on the drawings.
- D. Ceiling-mounted units shall be installed with ceiling grilles flush with the ceiling.

**END OF SECTION**

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## SECTION 15 051 - NOISE AND VIBRATION CONTROL

### PART 1 GENERAL

#### 1.01 DESCRIPTION

- A. Furnish and install vibration control devices, materials, and related items. Perform all work as shown on the drawings and as specified herein to provide complete vibration isolation systems in proper working order.

#### 1.02 MATERIAL AND EQUIPMENT

- A. Vibration isolation mounts shall be supplied by one of the following approved manufacturers:

Amber/Booth Co. (Houston, TX)	A.B.
Mason Industries, Inc. (Hauppauge, NY)	M.I.
Kinetics Noise Control, Inc. (Dublin, OH)	K.N.C.
Vibration Eliminator Co., Inc. (Copiague, NY)	V.E.
Vibration Mountings & Controls, Inc. (Butler, NJ)	V.M.&C

- B. Unless otherwise specified, supply only new equipment, parts and materials.
- C. Substitutions of equal equipment beyond the alternatives listed will be permitted only with the written permission of the Architect. Accompany each request for acceptance of substitute equipment with manufacturer's certified data proving the equivalence of the proposed substitute in quality and performance. The Architect shall be the final judge of the validity of the data submitted.
- D. Unless otherwise approved by the Architect, field-installed vibration isolation equipment shall be furnished by a single manufacturer or his authorized representative, who shall also be responsible for all work specified in this section to be performed by the manufacturer.

#### 1.03 REQUESTS FOR CHANGE

- A. Any requests for changes to the specifications must be submitted in writing at least ten days prior to bid closing. Approval will be given through a written addendum.

#### 1.04 QUALITY ASSURANCE

- B. Coordinate the size, location, and special requirements of vibration isolation equipment and systems with other trades. Coordinate plan dimensions with size of housekeeping pads.
- C. Provide vibration isolators of the appropriate sizes, with the proper loading to meet the specified deflection requirements.
- D. Supply and install any incidental materials such as mounting brackets, attachments and other accessories as may be needed to meet the requirements stated herein, even if not expressly specified or shown on the drawings, without claim for additional payment.

- E. Verify correctness of equipment model numbers and conformance of each component with manufacturer's specifications.
- F. Should any rotating equipment cause excessive noise or vibration when properly installed on the specified isolators, the Contractor shall be responsible for rebalancing, realignment, or other remedial work required to reduce noise and vibration levels. Excessive is defined as exceeding the manufacturer's specifications for the unit in question.
- G. Upon completion of the work, the Architect or Architect's representative shall inspect the installation and shall inform the installing contractor of any further work that must be completed. Make all adjustments as directed by the Architect that result from the final inspection. This work shall be done before vibration isolation systems are accepted.

#### 1.05 SUBMITTALS

- H. Refer to related sections elsewhere for procedural instructions for submittals.
- I. Before ordering any products, submit shop drawings of the items listed below. The shop drawings must be complete when submitted and must be presented in a clear, easily understood form. Incomplete or unclear presentation of shop drawings may be reason for rejection.
  - 1. A complete description of products to be supplied, including product data, dimensions, specifications, and installation instructions.
  - 2. Detailed selection data for each vibration isolator supporting equipment, including:
    - The equipment identification mark;
    - The isolator type;
    - The actual load;
    - The static deflection expected under the actual load;
    - The specified minimum static deflection.
  - 3. Steel rails, steel base frames, and concrete inertia bases showing all steel work, reinforcing, vibration isolator mounting attachment method, and location of equipment attachment bolts.
  - 4. Special details necessary to convey complete understanding of the work to be performed.
- J. Submission of samples may be requested for each type of vibration isolation device. After approval, samples will be returned for installation at the job if requested. All costs associated with submission of samples shall be borne by the Contractor.

#### 1.06 DESIGN REQUIREMENTS

- A. Design isolators for equipment installed outdoors to provide adequate restraint to withstand the force as required by code to any exposed surface of the isolated equipment. Isolators for outdoor equipment shall have bolt holes for attachment to equipment and to supports. The vibration isolation Vendor shall submit verifying shear and over turning calculations, for their product and equipment installation arrangement, stamped by a licensed Professional Engineer. The design and supply of miscellaneous support steel above and below isolators will not be the responsibility of the vibration isolation manufacturer.

#### 1.07 VIBRATION ISOLATION AND SEISMIC RESTRAINT

- A. Scope
  - 1. Provide isolators, flexible connections, and equipment bases for all rotating, piston driven, or vibrating equipment.

2. Guarantee specified isolation system deflections.
  3. Provide installation instructions, drawings, and field supervision to ensure proper installation and performance of all items specified in this section.
- B. Definitions
1. "Attachment Devices" are devices such as double sided beam clamps, concrete inserts, and attachment plates that serve to secure the supported device to the structure.
  2. "Positive Attachment" is defined as a support location with a cast-in or wedge type expansion anchor, a double-sided beam clamp, or a welded or through bolted connection to the structure.
  3. "Transverse Bracing" Restraint(s) applied to limit motion perpendicular or angular to the centerline of the pipe, duct, or conduit.
  4. "Longitudinal Bracing" Restraint(s) applied to limit motion perpendicular or angular to the centerline of the pipe, duct, conduit, etc.
  5. Life Safety Systems
    - a. All systems involved with fire protection, including sprinkler piping, fire pumps jockey pumps, fire pump control panels, service water supply piping, water tanks, and fire dampers.
    - b. All systems involved with and/or connected to emergency power supply, including all generators, transfer switches, transformers and all circuits to fire equipment.
    - c. All systems involved with and/or connected to emergency power supply, including all generators, transfer switches, transformers and all circuits to fire protection, smoke evacuation and/or emergency lighting systems.
- C. Reference Codes and Standards
1. 2000 International Building Code.
  2. "SMACNA Guidelines for Seismic Restraint of Mechanical Systems" - Second Edition (1998) with Addendum No. 1 (September 2000).
- D. Submittal Data Requirements
1. Submittals:
    - a. Catalog cuts or data sheets on specific products utilized, which detail compliance with the specification. Reference "TYPE" as per "PRODUCTS" section of this specification.
  2. Shop Drawings
    - a. Show base construction for equipment; include dimensions, weights, structural member sizes and support point locations.
    - b. Indicate isolation devices selected with complete dimensional and deflection data before condition is accepted for installation.
    - c. Calculate thrust for fan heads (axial and centrifugal fans) to determine whether thrust restraints are required.
- E. Manufacturer Inspection
1. Upon completion of installation of all vibration isolation, a certification report prepared by the manufacturer shall be submitted in writing to the contractor indicating that all systems are installed properly and in compliance with the specifications. The report must identify those areas that require corrective measures or certify that none exist.

## **PART 2 PRODUCTS**

### **2.01 VIBRATION ISOLATOR TYPES**

- A. General
1. All metal parts installed out-of-doors shall be corrosion resistant after fabrication. Galvanizing shall

- meet ASTM Salt Spray Test Standards and Federal Test Standard No. 14.
2. Isolators installed out-of-doors shall have base plates with bolt holes for fastening the isolators to the support members.
  3. Isolator types are scheduled to establish minimum standards. At the Contractor's option, labor-saving accessories can be an integral part of isolators supplied to provide initial lift of equipment to operating height, hold piping at fixed elevations during installation and initial system filling operations, and similar installation advantages. Accessories and seismic restraint features must not degrade the isolation performance of the isolators.
  4. Static deflection of isolators shall be as provided in the EXECUTION section and as shown on the drawings. All static deflections stated are the minimum acceptable deflection for the mounts under actual load. Isolators selected solely on the basis of rated deflections are not acceptable and will be disapproved.
- B. Type FSN (Floor Spring and Neoprene)
1. FSN isolators shall be freestanding and laterally stable without any housing. Spring diameter shall be not less than 0.8 of the compressed height of the spring at the rated load. Springs shall have a minimum additional travel-to-solid equal to 50% of the rated deflection. Springs shall be so designed that the ratio of horizontal stiffness to vertical stiffness is approximately 1 (one). Mounts shall have leveling bolts.
  2. The spring element in the isolator shall be set in a neoprene cup and have a steel washer or a flat surface in contact with the neoprene to distribute the load evenly over the bearing surface of the neoprene. Alternatively, each isolator shall be mounted on a Type NP isolator. If the NP isolator is used, a rectangular bearing plate of appropriate size shall be provided to load the pad uniformly within the manufacturer's recommended range. If the isolator is to be fastened to the building and the NP isolator is used, the holes in the isolator base plate shall be oversized and GROMMETS shall be provided for each base plate bolt hole.
  3. If the basic spring isolator has a neoprene friction pad on its base and an NP isolator is to be added to the base, a galvanized steel, stainless steel or aluminum bearing plate shall be used between the friction pad and the NP isolator. If the isolator is outdoors, bearing plates shall not be made of galvanized steel. The NP isolator, bearing plate and friction pad shall be permanently adhered to one another and to the bottom of the isolator base plate.
  4. Type FSN isolators shall be one of the following products with the appropriate neoprene pad (if used) selected from Type NP or approved equal:

Type SW	A.B.
Type SLF	M.I.
Type FDS	K.N.C.
Type OST	V.E.
Series AC	V.M.&C.
- C. Type FSNTL (Floor Spring and Neoprene Travel Limited)
1. FSNTL isolators shall be freestanding and laterally stable without any housing. Spring diameter shall be not less than 0.8 of the compressed height of the spring at the rated load. Spring shall have a minimum additional travel-to-solid equal to 50% of the rated deflection. Springs shall be so designed that the ratio of horizontal stiffness to vertical stiffness is approximately 1 (one). Mounts shall have leveling bolts. Mounts shall have vertical travel limit stops to control extension when weight is removed. The travel limit stops shall be capable of serving as blocking during erection of the equipment. A minimum clearance of 1/4" shall be maintained around restraining bolts and between

the limit stops and the spring to avoid interference with the spring action.

2. The spring element in the isolator shall be set in a neoprene cup and have a steel washer or a flat surface in contact with the neoprene to distribute the load evenly over the bearing surface of the neoprene. Alternatively, each isolator shall be mounted on a Type NP isolator. If the NP isolator is used, a rectangular bearing plate of appropriate size shall be provided to load the pad uniformly within the manufacturer's recommended range. If the isolator is to be fastened to the building and the NP isolator is used, the holes in the isolator base plate shall be oversized and GROMMETS shall be provided for each base plate bolt hole.
3. If the basic spring isolator has a neoprene friction pad on its base and an NP isolator is to be added to the base, a galvanized steel, stainless steel or aluminum bearing plate shall be used between the friction pad and the NP isolator. If the isolator is outdoors, bearing plates shall not be made of galvanized steel. The NP isolator, bearing plate and friction pad shall be permanently adhered to one another and to the bottom of the isolator base plate.
4. Type FSNTL isolators shall be one of the following products, with the appropriate neoprene pad (if used) selected from Type NP or approved equal:

Type CT	A.B.
Type SLR	M.I.
Type FLS	K.N.C.
Type KW	V.E.
Series AWR	V.M.&C.

D. Type FN (Floor Neoprene)

1. NP isolators shall be neoprene-in-shear type with steel reinforced top and base. All metal surfaces shall be covered with neoprene. The top and bottom surfaces shall be ribbed. Bolt holes shall be provided in the base and the top shall have a threaded fastener. The mounts shall include leveling bolts that may be rigidly connected to the equipment.
2. Type FN isolators shall be one of the following products or approved equal:

Type RVD	A.B.
Type ND	M.I.
Type RD	K.N.C.
Type D44	V.E.
Series RD	V.M.&C.

E. Type FNC (Floor Neoprene Constrained)

1. FNC isolators shall incorporate bridge-bearing neoprene elements with all-directional restraint. The mount shall consist of a ductile iron casting containing two separated and opposing molded neoprene elements. The elements shall prevent the central threaded sleeve and attachment bolt from contacting the casting during normal operation. Bolt holes shall be provided in the base and the top shall have a threaded fastener.
2. Type FNC isolators shall be one of the following products or approved equal:

Type BR	M.I.
Series RSM	V.M.&C.

F. Type PCF (Precompressed Fiberglass)

1. PCF isolator blocks shall be made of molded inorganic glass fiber that is individually coated and sealed with an impervious elastomeric membrane. Fiberglass shall be severely overloaded during the manufacturing process to stabilize the material into a product that is permanent and has consistent, predictable dynamic properties.
2. Type PCF isolators shall be one of the following products or approved equal.

- Type KIP K.N.C.
- G. Type NP (Neoprene Pad)
- NP isolators shall be one layer of 5/16" to 3/8" thick ribbed or waffled neoprene. The pads shall be sized so that they will be loaded within the manufacturer's recommended range.
  - Type NP isolators shall be one of the following products or approved equal:

Type NR	A.B.
Type W	M.I.
Type NPS	K.N.C.
Type 200N	V.E.
Series Maxi-Flex	V.M.&C.
- H. Type DNP (Double Neoprene Pad)
- DNP isolators shall be formed by two layers of 1/4" to 3/8" thick ribbed or waffled neoprene, separated by a galvanized steel, stainless steel or aluminum plate. If the isolator is outdoors, the plate shall not be made of galvanized steel. These layers shall be permanently adhered together. The pads shall be sized so that they will be loaded within the manufacturer's recommended range.
  - Type DNP isolators shall be formed from one of the following products or approved equal:

Type NR	A.B.
Type WSW	M.I.
Type NPS	K.N.C.
Type 200N (Multilayers)	V.E.
Series Maxi-Flex	V.M.&C.
- I. Type HSN (Hanger Spring and Neoprene)
- HSN isolators shall consist of a freestanding and laterally stable steel spring and a neoprene element in series, contained within a steel housing. Spring diameters and hanger housing lower hole sizes shall be large enough to permit the hanger rod to swing through a 30E arc before contacting the housing. Alternatively, other provisions shall be made to allow for a 30E arc of movement of the bottom hanger rod without contacting the isolator housing. Spring diameter shall be not less than 0.8 of the compressed height of the spring at the rated load. Spring elements shall have a minimum additional travel-to-solid equal to 50% of the rated deflection. The neoprene element shall be designed to have a 0.3" minimum static deflection. The deflection of both the spring element and the neoprene element shall be included in determining the overall deflection of Type HSN isolators.
  - A precompressed glass fiber element may be substituted for the neoprene element.
  - Type HSN isolators shall be one of the following products or approved equal:

Type BSR-A	A.B.
Type 30N	M.I.
Type SRH or SFH	K.N.C.
Type SNRC	V.E.
Type RSH 30A or RSHSC	V.M.&C.
- J. Type HN (Hanger Neoprene)
- HN isolators shall consist of a neoprene-in-shear element contained within a steel housing. A neoprene neck bushing shall be provided where the hanger rod passes through the hanger housing to prevent the rod from contacting the hanger housing.
  - A precompressed glass fiber element may be substituted for the neoprene element.
  - Type HN isolators shall be one of the following products or approved equal:

Type BRD-A	A.B.
Type HD	M.I.

Type RH or FH	K.N.C.
Type 3C	V.E.
Type RHD	V.M.&C.

2.02 EQUIPMENT BASES

A. Type BSR (Base - Steel Rail)

1. Steel rail bases shall consist of structural steel sections sized to provide a rigid beam that will not twist, deform, or deflect in any manner that will negatively affect the supported equipment or the vibration isolation mounts. Rail bases shall include mounting brackets for attachment of vibration isolators.
2. Type BSR bases shall be one of the following products or approved equal:

Type C or CIS	A.B.
Type R or ICS	M.I.
Type KRB or KFB	K.N.C.
Type CS	V.E.
Type WFR	V.M.&C.

B. Type BSF (Base - Steel Frame)

1. Steel frame bases shall consist of structural steel sections sized, spaced, and connected to form a rigid base which will not twist, rack, deform, or deflect in any manner which will negatively affect the supported equipment or the vibration isolation mounts. Frames shall be adequately sized to support basic equipment units and motors plus any associated pipe elbow supports, duct elbow supports, electrical control elements, or other components closely related and requiring resilient support in order to prevent vibration transfer to the building structure. The depth of steel frame bases shall be at least 1/10 the longest dimension of the base supported between isolators and not less than 6". The base footprint shall be large enough to provide stability for supported equipment.
2. Frame bases shall include side mounting brackets for attachment to vibration isolators. Mounting brackets shall be located on the sides of the base that are parallel to the axis of rotation of the supported equipment.
3. Type BSF bases shall be one of the following products or approved equal:

Type WX	A.B.
Type WFSL	M.I.
Type SFB	K.N.C.
Type HB	V.E.
Series WFB	V.M.&C.

C. Type BIB (Base - Inertia Base)

1. Inertia bases shall be formed of stone-aggregate concrete (150 lb./cu.ft.) and appropriate steel reinforcing cast between welded or bolted perimeter structural steel channels. Inertia bases shall be built to form a rigid base that will not twist, rack, deform, deflect, or crack in any manner that would negatively affect the supported equipment or the vibration isolation mounts. Inertia bases shall be adequately sized to support basic equipment units and motors plus any associated pipe elbow supports, duct elbow supports, electrical control elements, or other components closely related and requiring resilient support in order to prevent vibration transfer to the building structure. Inertia base depth shall be at least 1/12 the longest dimension of the base supported between isolators and not less than 6". The base footprint shall be large enough to provide stability for supported equipment. Inertia bases shall include side mounting brackets for attachment to vibration isolators. Mounting brackets shall be located on the sides of the base that are parallel to the axis of rotation of the supported equipment. Concrete may be provided by the General Contractor.

2. Frame and reinforcement for Type BIB bases shall be one of the following products or approved equal:

Type CPF	A.B.
Type KSL or BMK	M.I.
Type CIB-L or CIB-H	K.N.C.
Type SN	V.E.
Series MPF or WPF	V.M.&C.

D. Type RC-1 (Roof Curb, Type 1)

1. Type RC-1 isolation bases shall be a prefabricated assembly consisting of an extruded aluminum frame and steel spring isolation system that fits over the roof curb and under the isolated equipment. The aluminum frame shall be sufficiently rigid to support the equipment load without detrimental twist or deflection. Spring isolators shall be selected and positioned along the curb to achieve the minimum static deflection called for in the schedule. The static deflection shall be constant around the entire periphery of the base. Springs shall be free standing, laterally stable with a diameter of not less than 0.8 times the compressed height, and have additional travel-to-solid that is at least 50% of the rated deflection. Resilient neoprene snubbers shall be provided at the corners of the base to limit equipment movement to •• under wind load.
2. The isolation curb base shall be made weather tight by sealing all around the periphery with closed cell neoprene or flexible membrane that shall in no way inhibit the vibration isolation of the spring elements. Closed cell sponge gasketing or field caulking shall be used between the equipment unit and the isolation curb base and between the isolation curb and roof curb to form a weather-tight seal.

Each spring isolator used in the curbs shall be weather-protected as described in the PRODUCTS section under General.

3. Type RC-1 vibration isolation curb bases shall be supplied by the isolator manufacturer and shall be one of the following products or approved equal:

Type RTIR	A.B.
Type CMAB	M.I.
Type ASR	K.N.C.
Type AR	V.E.
Series AXR	V.M.&C.

E. Type RC-2 (Roof Curb, Type 2)

1. Type RC-2 isolation bases shall be a prefabricated assembly consisting of a structural steel frame and steel spring isolation system that also forms the roof curb under the isolated equipment. The steel frame shall be sufficiently rigid to support the equipment load without detrimental twist or deflection. Spring isolators shall be selected and positioned along the curb to achieve the minimum static deflection called for in the schedule. The static deflection shall be constant around the entire periphery of the base. Springs shall be free standing, laterally stable with a diameter of not less than 0.8 times the compressed height, and have additional travel-to-solid that is at least 50% of the rated deflection. Spring isolators shall include travel limit stops that are capable of serving as blocking during erection of the equipment. A minimum clearance of 1/4" shall be maintained around restraining bolts as they pass through the limit stop brackets. Springs and limits stops shall be provided at the corners of the base to limit equipment movement to •• under wind load.
2. The isolation curb base shall be made weather tight by sealing all around the periphery with closed cell neoprene, flexible membrane or light gauge spring metal loop, which shall in no way inhibit the vibration isolation of the spring elements. A closed cell sponge gasket or field caulking shall be used between the equipment unit and the isolation curb base and between the isolation curb and roof curb

to form a weather-tight seal. Each spring isolator used in the curbs shall be weather-protected as described in the PRODUCTS section under General.

3. Type RC-2 vibration isolation curb bases shall be supplied by the isolator manufacturer and shall be one of the following products or approved equal:
- |           |         |
|-----------|---------|
| Type RSC  | M.I.    |
| Type SSR  | K.N.C.  |
| Vibrocurb | ThyCurb |

#### 2.03 RESILIENT PENETRATION SLEEVE/SEAL

- A. Resilient penetration sleeve/seals shall be field-fabricated from a pipe or sheet metal section that is 1/2" to 3/4" larger than the penetrating element in all directions around the element, and shall be used to provide a sleeve through the construction penetrated. The sleeve shall extend 1" beyond the penetrated construction on each side. The space between the sleeve and the penetrating element shall be packed with glass fiber or mineral wool to within 1/4" of the ends of the sleeve. The remaining 1/4" space on each end shall be filled with acoustical sealant to form an airtight seal. The penetrating element shall be able to pass through the sleeve without contacting the sleeve. Alternatively, prefabricated sleeves accomplishing the same result are acceptable.

#### 2.04 RESILIENT LATERAL SUPPORTS

- A. These units shall either be a standard product of the vibration isolator manufacturer, or be custom fabricated from standard components. These units shall incorporate neoprene isolation elements similar to Type FN that are specifically designed to provide resilient lateral bracing of ducts or pipes.
- B. Resilient lateral supports shall be one of the following products or approved equal:

Type Custom	A.B.
Type ADA	M.I.
Type RGN	K.N.C.
Type VERG or VPL	V.E.
Type MDPA	V.M.&C.

#### 2.05 FLEXIBLE DUCT CONNECTIONS

- A. Flexible duct connections shall be made from coated fabric. The clear space between connected parts shall be a minimum of 3" and the connection shall have a minimum of 1.5" of slack material.

#### 2.06 FLEXIBLE PIPE CONNECTIONS

- A. Flexible pipe connections shall be fabricated of multiple plies of nylon cord, fabric, and neoprene; and shall be vulcanized so as to become inseparable and homogeneous. Flexible connections shall be formed in a double sphere shape, and shall be able to accept compressive, elongating, transverse, and angular movements.
- B. The flexible connections shall be selected and specially fitted, if necessary, to suit the system temperature, pressure, and fluid type. In addition, suitable flexible connections should be selected, if possible, which do not require rods or cables to control extension of the connector.



Sonoloc  
Acoustical Sealant #834 (Acrylic Latex)  
Acoustical sealant

Sanborn  
Tremco  
U.S.G.

### PART 3 EXECUTION

#### 3.01 APPLICATION

##### A. General

1. Refer to the PRODUCTS section of this specification for vibration isolation devices identified on the drawings or specified herein.
2. The static deflection of all isolators specified herein are the minimum acceptable deflections for the mounts under actual load. Isolators selected solely on the basis of rated deflection are not acceptable and will be disapproved.

##### B. Major Equipment Isolation

1. Unless otherwise shown or specified, all floor-mounted major equipment shall be set on housekeeping pads. See architectural or structural drawings for details.
2. Types and minimum static deflections of vibration isolation devices for major equipment items shall be as scheduled on the drawings or specified hereunder.
3. Flexible duct connections shall be installed at all fan unit intakes, fan unit discharges, and wherever else shown on the drawings.
4. Flexible pipe connections shall be installed at all pipe connections to vibration-isolated equipment in the positions shown on the drawings.
5. Electrical connections to vibration-isolated equipment shall be flexible, as called for in the electrical portion of the specification.
6. Thrust restraints shall be installed on all suspended fans and on all floor-mounted fans developing 4" or more of static pressure, unless the horizontal component of the thrust force can be demonstrated to be less than 10% of the equipment weight.

##### C. Miscellaneous Mechanical Equipment Isolation

1. Miscellaneous pieces of mechanical equipment, such as converters, pressure reducing stations, dryers, strainers, storage tanks, condensate receiver tanks, and expansion tanks, which are connected to isolated piping systems, shall be vibration-isolated from the building structure by Type NP or Type HN isolators (selected for 0.1" static deflection), unless their position in the piping system requires a higher degree of isolation as called for under Pipe Isolation.

##### D. Pipe Isolation

1. All chilled water and steam piping that is connected to vibration-isolated equipment shall be isolated from the building structure within the following limits:
  - a. Within mechanical rooms;
  - b. Within 50' total pipe length of connected vibration-isolated equipment (chillers, pumps, air handling units, pressure reducing stations, etc.);
  - c. At every support point for piping that is greater than 4 inches in diameter.
2. Piping shall be isolated from the building structure by means of vibration isolators, resilient lateral supports, and resilient penetration sleeve/seals.
3. Isolators for the first three support points adjacent to connected equipment shall achieve one half the specified static deflection of the isolators supporting the connected equipment. When the required static deflection of these isolators is greater than 1/2", Type FSN or HSN isolators shall be used. When the required static deflection is less than or equal to 1/2", Type FN or HN isolators shall be

used. All other pipe support isolators within the specified limits shall be either Type FN or HN achieving at least 1/4" static deflection.

4. Where lateral support of pipes is required within the specified limits, this shall be accomplished by use of resilient lateral supports.
5. Pipes within the specified limits that penetrate the building construction shall be isolated from the building structure by use of resilient penetration sleeve/seals.
6. Provide flexible pipe connections as called for under Major Equipment above and wherever shown on the drawings.

**E. Duct Isolation**

1. All sheet metal ducts and air plenums that are within mechanical rooms or within a distance of 50' total duct length of connected vibration-isolated equipment (whichever is longer) shall be isolated from the building structure by Type FN, PCF or HN isolators. All isolators shall achieve 0.1" minimum static deflection.
2. Ducts within the specified limits that penetrate the building construction shall be isolated from the building structure by use of resilient penetration sleeve/seals.
3. Flexible duct connections shall be provided as called for above under Major Equipment and wherever shown on the drawings.

**3.02 INSTALLATION OF VIBRATION ISOLATION EQUIPMENT**

**A. General**

1. Locations of all vibration isolation devices shall be selected for ease of inspection and adjustment as well as for proper operation.
2. Installation of vibration isolation equipment shall be in accordance with the manufacturer's instructions.

**B. Isolators**

1. All vibration isolators shall be aligned squarely above or below mounting points of the supported equipment.
2. Isolators for equipment with bases shall be located on the sides of the bases which are parallel to the equipment shaft unless this is not possible because of physical constraints.
3. Locate isolators to provide stable support for equipment, without excess rocking. Consideration shall be given to the location of the center of gravity of the system and the location and spacing of the isolators. If necessary, a base with suitable footprint shall be provided to maintain stability of supported equipment, whether or not such a base is specifically called for herein.
4. If a housekeeping pad is provided, the isolators shall bear on the housekeeping pad and the isolator base plates shall rest entirely on the pad.
5. Hanger rods for vibration-isolated support shall be connected to major structural members, not the floor slab between major structural members. Provide suitable intermediate support members as necessary.
6. Vibration isolation hanger elements shall be positioned as high as possible in the hanger rod assembly, but not in contact with the building structure, and so that the hanger housing may rotate a full 360E about the rod axis without contacting any object.
7. Parallel running pipes may be hung together on a trapeze that is isolated from the building. Isolator deflections must be the greatest required by the provisions for pipe isolation for any single pipe on the trapeze. Do not mix isolated and unisolated pipes on the same trapeze.
8. Pipes, ducts and equipment shall not be supported from other pipes, ducts and equipment.
9. Resiliently isolated pipes, ducts and equipment shall not come in rigid contact with the building construction or rigidly supported equipment.

10. The installed and operating heights of equipment supported by Type FSNTL isolators or with Type RC-2 isolation bases shall be identical. Limit stops shall be out of contact during normal operation. Adjust isolators to provide 1/4" clearance between the limit stop brackets and the isolator top plate, and between the travel limit nuts and travel limit brackets.
  11. Adjust all leveling bolts and hanger rod bolts so that the isolated equipment is level and in proper alignment with connecting ducts or pipes.
- C. Bases
1. No equipment unit shall bear directly on vibration isolators unless its own frame is suitably rigid to span between isolators and such direct support is approved by the equipment manufacturer. This provision shall apply whether or not a base frame is called for on the schedule. In the case that a base frame is required for the unit because of the equipment manufacturer's requirements and is not specifically called for on the equipment schedule, a base frame recommended by the equipment manufacturer shall be provided at no additional expense.
  2. Unless otherwise indicated, there is to be a minimum operating clearance of 1" between steel rails, steel frame bases or inertia bases and the floor beneath the equipment. The isolator mounting brackets shall be positioned and the isolators adjusted so that the required clearance is maintained. The clearance space shall be checked by the Contractor to ensure that no construction debris has been left to short circuit or restrict the proper operation of the vibration isolation system.
  3. Isolation bases shall be installed in strict accordance with the manufacturer's instructions.
- D. Flexible Duct Connections
1. Prior to installation of the flexible connection, sheet metal ducts and plenum openings shall be squarely aligned with the fan discharge, fan intake, or adjacent duct section, and the gap between connected parts shall be uniform. Flexible duct connections shall not be installed until this provision is met. There shall be no metal-to-metal contact between connected sections, and the fabric shall not be stretched taut.
- E. Flexible Pipe Connections
1. Install flexible pipe connections in strict accordance with the manufacturer's instructions.
- F. Thrust Restraints
1. Thrust restraints shall be attached on each side of the fan parallel to the thrust force. This may require custom brackets or standoffs. The body of the thrust restraint shall not come in contact with the connected elements. Thrust restraints shall be adjusted to constrain equipment movement to the specified limit.
- G. Grommets
1. Where grommets are required at hold down bolts of isolators, bolt holes shall be properly sized to allow for grommets. The hold down bolt assembly shall include washers to distribute load evenly over the grommets. Bolts and washers shall be galvanized.
- H. Resilient Penetration Sleeve/Seals
1. Maintain an airtight seal around the penetrating element and prevent rigid contact between the penetrating element and the building structure. Fit the sleeve tightly to the building construction and seal airtight on both sides of the construction penetrated with acoustical sealant.

**END OF SECTION**



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## SECTION 15 052 - PIPING AND ACCESSORIES

### PART 1 GENERAL

#### 1.01 GENERAL REQUIREMENTS

- A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 15010, General Requirements for Heating, Ventilating and Air Conditioning.

#### 1.02 WORK INCLUDED

- A. The work under this Section shall include all labor, materials, accessories, services and equipment necessary to furnish and install all piping and accessories, complete, as indicated on the Drawings and as specified herein.
- B. Without limiting the generality thereof, the work in this Section shall include the following items:
  - 1. Piping and pipe supports.
  - 2. Valves.
  - 3. Strainers.
  - 4. Thermometers.
  - 5. Pressure gauges.
- C. Makeup water connections from the connection left under the Plumbing Section to the systems shall be the same as specified under Plumbing for Cold Water.

### PART 2 PRODUCTS

#### 2.01 PIPING

- A. In general, all chilled water supply and return piping shall be Schedule 40 black steel, 12" and larger standard weight, ASTM A-120 minimum with welded, grooved or screwed joints. Fittings in lines 2" and smaller shall be screwed end, black, 150 pound malleable iron. Unions, 2" and smaller, shall be 150 pound, ground joint with brass to iron seats. Fittings in lines 2-1/2" and larger shall be Standard weight forged steel welded or grooved fittings. Flanges shall be of the welding slip on type. Branch piping connections may be made using welding nozzles such as Weldolets or Thredolets and manufactured by Bonney Forge & Tool Works or equal. All welding shall be in accordance with the Standard Manual of Pipe Welding Contractors National Association.
- B. Final connections to equipment shall be made with unions or flanges.
- C. Gaskets for flanged joints shall be 1/16 inch thick, suitable for the service.
- D. The condensate waste piping from the air conditioning unit drain pans shall be Type "M" copper. The piping shall have a 6 inch loop seal at each unit and run to nearest drain or as indicated on the Drawings. Drain piping from all plenums for air intakes shall be run to nearest practical floor drain and shall terminate with an elbow turned down into the drains and pump drains shall be Type "M" copper with wrought fittings.
- E. The city water piping to all HVAC equipment shall be Type "L" hard tempered copper with wrought copper fittings. It shall be installed as detailed on the plans and in compliance with the equipment manufacturer's

recommendations. The water supply will be left by the Plumbing Subcontractor and extended and connected to the equipment by the HVAC Subcontractor. This piping will be insulated to match that which the Plumbing Subcontractor supplies.

- F. High points of each water main shall be fitted with a manual air vent. Low points of water systems shall be fitted with 3/4" drain valves with hose bibbs.

## 2.02 PIPE SUPPORTS

- A. All pipe supports, clamps, and inserts shall be provided under this Section. Pipe hanger assemblies shall include turnbuckles or other means of vertical adjustment. Trapeze hangers may be used in lieu of separate hangers for closely spaced, parallel lines. Pipe hangers shall be as manufactured by Carpenter & Patterson, Inc., Calco Steel Products Company, Michigan, Grinnell, P.H.D. or approved equal. Product numbers used below are Carpenter and Patterson.

- B. Hangers for steel piping 2 inches and smaller shall be Figure 100 band type. Hangers for piping 2-1/2 inches to 5 inches shall be Figure 100. Hangers for piping 6 inches and larger shall be Figure 100. Hangers shall have steel rods with 2 nuts and shall be suspended from suitable beam clamps or concrete inserts. Rod sizes shall be as recommended by the support manufacturer and at least the following:

Pipe to 2 inches	3/8" diameter
2-1/2" to 3"	1/2" diameter
4" to 5"	5/8" diameter
6"	3/4" diameter
8" and larger	7/8" diameter

Rod for trapeze hangers supporting several pipes shall be sized for the equipment load.

Maximum spacing hangers and supports for all piping shall be:

2 inches and smaller	10 feet on centers
2-1/2 inches and larger	12 feet on centers

- C. Hangers for copper piping shall be similar to above for steel piping but where in contact with the copper piping, they shall be copper plated.
- D. Hangers for insulated lines shall have insulation saddles and shields.
- E. Pipe Vibration Hangers:
  - 1. All piping attached to the building serving air handlers, air conditioners, pumps, chillers, etc., with rotating or pulsating parts shall be hung on spring isolation hangers for at least twenty (20) feet horizontally from where it attaches to any of the above. The spring hangers shall be capable of one (1) inch deflection and when actually loaded, have at least one-half (1/2) inch deflection.

## 2.03 VALVES

- A. All valves shall be as manufactured by Nibco, Milwaukee, Stockham, Hammond, Crane Company, Lunkenheimer Centerline, Combination Pump Valve Company, Victaulic or DeZurik. Unless otherwise indicated, the figure numbers indicated below are from Jenkins Brothers as a means of identifying type, quality, materials and workmanship desired. Valves of equal quality shall be furnished with sweat connection in copper piping.

- B. Gate, butterfly or ball valves shall be installed in the supply connections to each piece of equipment and as indicated on the Drawings or as required.
- C. Gate and globe valves 2 inches and smaller shall be 150 pound bronze, screwed end, union bonnet valves. Gate valves shall be Figure 47-U solid wedge, inside screw and traveling stem. Globe valves shall be Figure 546-P regrind and renewable stainless plug and seat ring.
- D. Gate valves 2-1/2 inch and larger shall be 125 pound iron body, bronze trim, outside screw and yoke, rising stem and solid wedge Figure 651-A flanged.
- E. Ball valves shall be used on all water lines 2" and smaller for shut-off service. Valves shall have bronze body, 316 stainless steel ball and stem, conventional port and shall be designed with an adjustable packing box, a stem retaining collar such that the stem shall not be capable of removal from the valve while it is under pressure, and shall be equipped with packing suitable for the intended service. The pressure temperature rating of the valves shall not be less than the design criteria applicable to all components of the system.
- F. Globe valves 2-1/2 inch and larger shall be 125 pound iron body, outside screw and yoke, regrindable and renewable bronze disc and seat ring figure 613 flanged.
- G. Check valves as required in lines 2 inches and smaller shall be 150 pound bronze, horizontal swing type with regrinding bronze seat and disc that may be reground without removing the valve from the line; screwed end, Figure 92-A.
- H. Check valves in lines 2-1/2 inches and larger shall be 125 pound iron bronze mounted, swing checks with flanged or grooved ends and regrindable and renewable bronze disc and seat ring; Figure 624. At Contractor's option, spring loaded wafer type check valves may be used.
- I. Comparative valves that may be supplied:
- |          |           |         |             |
|----------|-----------|---------|-------------|
| Crane    | Fairbanks | Powell  | Lukenheimer |
| 431-UB   | U-0226    | 27005   | 3127        |
| 14-1/2-P | 0525      | 2600    | LQ-600-150  |
| 465-1/2  | 0405      | 1793    | 1430        |
| 351      | 0131      | 241     | 1123        |
| 37       | 0640      | 578     | 2114        |
| 373      | 0702      | 559     | 1790        |
| 28E      | 0151-0153 | 378-368 |             |
- J. Chain operated wheels shall be installed on all hand wheel valves which are over seven feet from the floor to the valve stem. Chain length will be to within 6'-6" of the floor.
- K. Drain valves shall be angle 3/4 inch pattern bronze valves with renewable disc and hose thread outlet.
- L. Butterfly valves 2-1/2 inches and larger: MSS SP-67; rated at 200 psi; cast iron body conforming to ASTM A 126, Class B. Provide valves with field replaceable EPDM sleeve, nickel plated ductile iron disc stainless steel stem and EPDM O-ring stem seals. Provide lever operators with locks for sizes 2 through 6 inches and gear operators with position indicator for sizes 8 through 24 inches. Provide lug grooved or wafer type as indicated. Drill and tap valves on dead end services or those requiring additional body strength.

**2.04 SLEEVES AND PLATES**

- A. All pipes passing through masonry walls shall be fitted with schedule 40 steel sleeves. Sleeves shall be of the first possible size larger than the outside diameter of the pipe to be sleeved or the insulation jacket on covered pipes. Sleeves shall be flush on either side of the masonry walls.
- B. All pipes passing through the masonry floors shall be fitted with schedule 40 steel sleeves of the first size larger than the pipe to be sleeved. All sleeves on these floors shall extend one inch above the finished floor. All pipe sleeves through the floors of the Mechanical Room shall be galvanized steel, 2 inches high above the finished floor. After the pipes are installed, all sleeves shall be packed around the pipes with fiberglass to 1/2 inch from the top of the sleeves, then topped off with a 1/2 inch depth of sealant such as PRC-Rubber caulk 7000 or other such approved sealant.
- C. All exposed, uncovered pipes passing through walls or ceilings shall be fitted with chromium plated spun or split type escutcheons with a clamping device for holding the escutcheon in position.
- D. All exposed uncovered pipes passing through floors shall be fitted with chromium plated spun or split type escutcheons which shall be high enough to cover the pipe sleeve and shall be fitted with a clamping device for holding the escutcheon in position and which shall rest upon the finished floor.

**2.05 STRAINERS**

- A. Furnish & install a full size Y-pattern strainer Mueller Corp., Keckley, Victaulic or equal on the inlet side of each water circulating pump and wherever else shown on the Drawings or as required.
- B. The strainer shall have cast iron or bronze bodies of ample strength for the pressure to which they shall be subjected; removable cylindrical or conical screens of stainless steel or brass; and suitable flanges, grooves or tappings for connections to the piping they serve. They shall be of such design as to allow blowing out of the accumulated dirt and to facilitate removal and replacement of a strainer screen without disconnecting the main piping.
- C. An approved valved dirt blowing connection shall be made to each strainer with the valve located 6 inches to 12 inches below the strainer. In the case of strainers under high pressure steam or water pressure, the blowout connection shall terminate at a point where there will be no risk of flooding or damage as directed by the Engineer.
- D. Screens on water service shall have 1/16" perforations on strainers 3" & smaller & 1/8" perforations on strainers 4" & larger.

**2.06 PRESSURE GAUGES**

- A. Pressure gauges shall be furnished and installed at the suction and discharge connections of each pump, at each coil, or piece of equipment in the system exclusive of accessories unless shown otherwise.
- B. Gauges shall be 4-1/2 inch diameter with metal case, bronze movement, bronze bourdon tube and brass ring. Gauges shall be accurate within one percent over the entire scale. All gauges shall have "T" handle cocks.
- C. Gauges shall have a dial range that will provide a reading at maximum design operating pressure of between 50% and 75% of the dial range. Systems that will go into a vacuum shall also read 0 to 30 inches of vacuum.

- D. Gauges shall be so placed as to be easily readable from the floor.
- E. As an alternate to the above gauges, Contractor may substitute Pete's Plugs with one master gauge.

#### 2.07 THERMOMETERS

- A. Thermometers shall be adjustable angle front reading red mercury type with 12" scale. Case shall be cast aluminum.
- B. Angle adjustment shall utilize two positive locking set screws.
- C. Furnish thermometers of temperature range suited for systems in which they are installed.
- D. Thermometer wells shall be the full immersion type matched to thermometer stem length.
- E. Furnish thermometers and accessories as manufactured by Weiss, Trerice or approved equal, at each piece of equipment that causes a temperature change in a fluid.

#### 2.08 FLEXIBLE CONNECTIONS

- A. Furnish and install the flexible connections in the piping at all equipment subject to movement or vibration.
- B. At contractor's option the use of a minimum of three (3) flexible type grooved couplings may be substituted for flexible connections. Consult coupling manufacturer for proper installation requirements.
- C. At a minimum, flexible connections shall be provided at connections to cooling towers, chillers and base mounted pumps.

#### 2.09 HEAT CABLE FOR FREEZE PROTECTION OF PIPING

- A. Provide electric heat tracing on all exterior chilled water piping, valves and accessories above grade.
- B. Electric heat cable shall be installed linearly along the bottom of the pipe and allowance shall be made for all fittings, valves, pipe supports, etc. Cable shall be installed prior to insulation of the piping system.
- C. Electric cable shall be capable of maintaining a minimum water temperature of 40 degrees F. at an ambient air temperature of 0 degrees F.
- D. The electric cable shall be the self-regulating type which responds to varying localized temperature conditions by varying the heat output along its length. This shall be accomplished by a self-regulating core which varies its resistance continuously with changes in temperature. A constant wattage heater is unacceptable.
- E. Provide a thermostat control which deenergizes the heating cable when the ambient air temperature is above 40 degrees F. (adjustable). While energized, the heat cable shall be entirely self-regulating.
- F. Provide all power connection hardware, splices, end seals, etc to accomplish installation. All hardware

shall be by the same manufacturer as the cable.

- G. Electric heating cable and accessories shall be U.L. listed. Electric heating cable shall conform to all requirements of Division 16.
- H. Electric heating cable shall be Raychem XL or approved equal.

#### 2.10 PIPING IDENTIFICATION

- A. A marker showing the service and an arrow indicating the direction of flow shall be applied on the following piping installed under this Section of the Specifications:
  - 1. Chilled water.
  - 2. Steam piping.
- B. In general, the piping shall be labeled at each wall penetration (both sides), riser equipment and each change of direction. In addition, straight runs of piping shall be labeled at intervals not greater than 50 feet.
- C. The letter size and background color shall conform with the Identification of Pipe System ANSI/ASME A13.1. The vinyl plastic markers shall be as manufactured by Seton Name-Plate Co., W.H. Brady Co., or Westline Products.

### **PART 3 EXECUTION**

#### 3.01 INSTALLATION

- A. The Drawings are diagrammatic and the final arrangement of the work shall suit field conditions, the characteristics of the materials used and the instructions of the Engineer. Verify all dimensions in the field. Access and clearances must be provided and maintained for the proper operation, maintenance service and repair of the work.
- B. Install in the piping all automatic control valves, thermometer wells, and like apparatus furnished by the temperature control manufacturer.
- C. Hangers shall be arranged to maintain the required grading and pitch of piping, to prevent vibration and to provide for expansion and contraction.
- D. Each vertical line shall be supported at its base using a suitable hanger placed in the horizontal line near the riser, unless otherwise noted, for base elbow support.

#### 3.02 TESTING OF PIPING

- A. Supply all materials, labor, and power required for testing. Make preliminary tests and prove work satisfactory. Notify the Engineer in ample time to be present for final testing of all piping. Tests shall be made before insulation or concealing any piping.
- B. Repair defects disclosed by tests or, if required by the Engineer, replace defective work with new work without additional cost to the Owner. Repairs to piping systems shall be made with new material. No caulking of screwed joints, cracks or holes will be accepted. Make tests in stages to facilitate work of others. Use of wicking in tightening leaking joints is not permitted.

- C. The Contractor shall be responsible for work disturbed or damaged by tests and/or repair and replacement of his work and shall cause work so disturbed or damaged to be restored to its original condition at no additional expense to the Owner.
  
- D. Unless otherwise specified, all piping shall be hydrostatically tested to 150 psi. Tests shall be of 2 hours duration during which time piping shall show no leaks and during which time no sealing of leaks will be permitted. Any equipment not capable of withstanding test pressures shall be suitably isolated from test pressure.

**END OF SECTION**



## SECTION 15 117 - PACKAGED AIR-COOLED CHILLER

### PART 1 GENERAL

#### 1.01 DESCRIPTION

- A. Furnish and install all packaged air-cooled chillers of the size, type, capacity and characteristics as shown on the equipment schedules and herein described.
- B. Equipment schedules and specifications are based on Carrier. Other manufacturers of equal quality and performance may be submitted to the Engineer for review. When substitution of equipment is made, the Contractor shall be responsible for the costs of any item and engineering and construction revisions necessary in his or any other contract or trade that may be required to satisfy plans and specifications.

### PART 2 PRODUCTS

#### 2.01 GENERAL

- A. Provide microprocessor controlled aircooled liquid chiller as manufactured by Carrier. Unit shall be factory assembled, single piece liquid chiller, contained within the unit. Cabinet shall be all factory wiring, piping, controls, refrigerant charge. Unit shall be rated in accordance with ARI Standard 590. Unit construction shall comply with ANSI B9.1 Safety Code, NEC and all applicable Codes. Unit shall be capable of withstanding Federal Test Method Standard No. 141. Cooler shall be tested and stamped in accordance with ASME Code for a refrigerant working side pressure of 235 PSIG and a minimum waterside of 250 PSIG. Aircooled condenser coils shall be leak tested at 150 PSIG and pressure tested at 450 PSIG.
- B. Entire unit shall have a 1 year warranty. Compressors shall have a 5 year parts warranty.
- C. The basic unit shall be fabricated of galvanized steel casing. Zinc phosphatized with a baked enamel finish. Provide hinged access panels both sides for controls and power. Access panels to coils and compressors shall be removable.

#### 2.02 CONDENSER FANS

- A. Condenser fans shall be direct driven propeller type, all with permanently lubricated bearings. Statically and dynamically balanced, discharging air vertically upward. Shafts shall have inherent corrosion resistance.

#### 2.03 COMPRESSORS

- A. Compressors shall be scroll compressor type. Equipped with an automatically reversible oil pump, operating oil charge, suction and discharge shutoff valves and an insert-type factory sized crankcase heater to control oil dilution; each mounted on spring vibration isolators with an isolation efficiency of no less than 95%.

#### 2.04 COOLER

- A. Cooler shall be shell and tube type with removable heads. Tubes shall be internally enhanced seamless copper type rolled into tube sheets. Equipped with flanged type water connections. Shell shall be

insulated with 3/4" (17mm) closed cell PVC foam of maximum K factor 0.28. Equipped with electric heaters along the shell under the insulation to protect against cooler freeze-up. Design shall incorporate two (2) independent direct expansion refrigerant circuits.

**2.05 CONDENSER**

- A. Condenser: Coil shall be air-cooled with integral subcooler, constructed of aluminum fins mechanically bonded to seamless copper tubes which are then cleaned, dehydrated and sealed.

**2.06 REFRIGERANT CIRCUIT**

- A. Refrigerant circuit components shall include hot gas muffler, high side pressure relief device, liquid line shutoff valve, suction and discharge pressure gauges with manual shutoff valves, replaceable core filter drier, moisture indicating sight glass, stepper motor actuated electronic expansion valve, and complete operating charge of refrigerant R-22 and compressor oil.

**2.07 CONTROLS, SAFETIES AND DIAGNOSTICS**

A. Controls:

1. Unit controls shall include the following minimum components:
  - Microprocessor.
  - Power and control circuit terminal blocks.
  - On/off control switch.
  - Replaceable solid state relay panel.
  - Leaving chilled water setpoint panel.
  - Thermistors and/or potentiometers.
2. Capable of performing the following functions:
  - Automatic compressor lead-lag.
  - Pumpout at beginning and end of every circuit cycle.
  - Capacity control based on leaving chilled water temperature and compensated by rate of change of return water temperature.
  - Limit the chilled water temperature pulldown rate at startup to 1 degree F. per minute to prevent excessive demand spikes (charges) at startup.
3. Control compartment shall be equipped with a 115 volt convenience outlet.

B. Safeties:

1. Unit shall be equipped with thermistors and/or potentiometers and all necessary components in conjunction with the control system to provide the unit with the following protections:
  - Loss of refrigerant charge protection.
  - Low water flow protection.
  - Low chilled water temperature protection.
  - Low and high superheat protection.
  - Low oil protection for each compressor circuit.
  - Low control voltage (to unit) protection.
  - Ground current protection for each compressor which shuts down compressor when no more than 2.5 supply amps are measured to prevent formation of acids.
2. Compressors shall be equipped with the following manual reset type protections:
  - Thermal overload.
  - Pressure overload.
  - Electrical overload through the use of definite purpose contactors and calibrated, ambient

compensated, magnetic trip circuit breakers. Circuit breakers shall open all three phases in the event of an overload in any one phase, or single phasing condition.

3. Fan motors shall have inherent overcurrent protection.

C. Diagnostics:

1. Diagnostic display module shall be capable of indicating the safety lockout condition through displaying a two (2) number code for which a legend shall be provided in control panel. Protections included for display shall be:  
Compressor lockout.  
Loss of charge.  
Low waterflow.  
Low oil pressure.  
Cooler freeze protection.  
High or low suction superheat.  
Thermistor or potentiometer malfunction.
2. Module in conjunction with the microprocessor must also be capable of displaying the output (results) of a run test to verify operation of every switch, thermistor, potentiometer, fan and compressor before chiller is started.

2.08 OPERATING CHARACTERISTICS

- A. Unit shall be capable of starting and running at outdoor ambient temperatures up to 115 degrees F. per maximum load criteria of ARI Standard 590.
- B. Unit shall be capable of starting up with 95 degrees F. entering water temperature to the cooler.

2.09 MOTORS

- A. Compressor motors shall be cooled by suction gas passing around motor windings.
- B. Condenser fan motors shall be three (3) phase type with permanently lubricated bearings and Class B insulation.

2.10 ELECTRICAL REQUIREMENTS

- A. Unit primary electrical power supply shall be connected to a single point.
- B. Unit shall operate on three (3) phase, 60 cycle power at the voltage shown in the equipment schedule.

**PART 3 EXECUTION**

3.01 GENERAL

- A. Unit shall be installed in strict accordance with manufacturer's recommendations.
- B. Unit start-up shall be performed by factory authorized service personnel.

**END OF SECTION**

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## SECTION 15150 - AUTOMATIC CONTROLS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. All work of this Division shall be coordinated and provided by the single Facilities Management System (FMS) Contractor.
- B. The work of this Division shall be scheduled, coordinated, and interfaced with the associated work of other trades. Reference the Specifications Documents for details.
- C. The work of this Division shall be as required by the Specifications, Point Schedules and Drawings.
- D. If the FMS Contractor believes there are conflicts or missing information in the project documents, the Contractor shall promptly request clarification and instruction from the design team.

#### 1.02 DEFINITIONS

- A. Analog: A continuously variable system or value not having discrete levels. Typically exists within a defined range of limiting values.
- B. Binary: A two-state system where an "ON" condition is represented by one discrete signal level and an "OFF" condition is represented by a second discrete signal level each separated by a defined deadband.
- C. Facility Management System (FMS): The total integrated system of fully operational and functional elements, including equipment, software, programming, and associated materials, to be provided by this Division FMS Contractor and to be interfaced to the associated work of other related trades.
- D. FMS Contractor: The single Contractor to provide the work of this Division. This Contractor shall be the primary manufacturer, installer, commissioner and ongoing service provider for the FMS work.
- E. Control Sequence: An FMS pre-programmed arrangement of software algorithms, logical computation, target values and limits as required to attain the defined operational control objectives.
- F. Direct Digital Control: The digital algorithms and pre-defined arrangements included in the FMS software to provide direct closed-loop control for the designated equipment and controlled variables. Inclusive of Proportional, Derivative and Integral control algorithms together with target values, limits, logical functions, arithmetic functions, constant values, timing considerations and the like.
- G. FMS Network: The total digital on-line real-time interconnected configuration of FMS digital processing units, workstations, panels, sub-panels, controllers, devices and associated elements individually known as network nodes. May exist as one or more fully interfaced and integrated sub-networks, LAN, WAN or the like.
- H. Node: A digitally programmable entity existing on the FMS network.
- I. FMS Integration: The complete functional and operational interconnection and interfacing of all FMS work elements and nodes in compliance with all applicable codes, standards and ordinances so as to provide a

single coherent FMS as required by this Division.

- J. Provide: The term "Provide" and its derivatives when used in this Division shall mean to furnish, install in place, connect, calibrate, test, commission, warrant, document and supply the associated required services ready for operation.
- K. PC: IBM-compatible Personal Computer from a recognized major manufacturer. PC "clones" are not acceptable.
- L. Furnish: The term "Furnish" and its derivatives when used in this Division shall mean supply at the FMS Contractor's cost to the designated third party trade contractor for installation. FMS Contractor shall connect furnished items to the FMS, calibrate, test, commission, warrant and document.
- M. Wiring: The term "Wiring" and its derivatives when used in this Division shall mean provide the FMS wiring and terminations.
- N. Install: The term "Install" and its derivatives when used in this Division shall mean receive at the jobsite and mount.
- O. Protocol: The term "protocol" and its derivatives when used in this Division shall mean a defined set of rules and standards governing the on-line exchange of data between FMS network nodes.
- P. Software: The term "software" and its derivatives when used in this Division shall mean all of programmed digital processor software, preprogrammed firmware and project specific digital process programming and database entries and definitions as generally understood in the FMS industry for real-time, on-line, integrated FMS configurations.
- Q. The use of words in the singular in these Division documents shall not be considered as limiting when other indications in these documents denote that more than one such item is being referenced.
- R. Headings, paragraph numbers, titles, shading, bolding, underscores, clouds and other symbolic interpretation aids included in the Division documents are for general information only and are to assist in the reading and interpretation of these Documents. They do not form a formal part of the Documents and may not be consistent or complete in their use throughout the Documents.

#### 1.03 CONTRACTOR QUALIFICATIONS

- A. Qualified Bidders: System shall be Metasys as manufactured, installed and serviced by Johnson Controls, Inc., Southeast Area office, Roswell, GA. Bids from franchised dealers or manufacturer's representatives shall not be considered.

#### 1.04 FMS DESCRIPTION

- A. The work of the single FMS Contractor shall be as defined individually and collectively in all Sections of this Division specifications together with the associated Point Sheets and Drawings and the associated interfacing work as referenced in the related documents as are listed in Part 1 of this Section.
- B. The FMS work shall consist of the provision of all labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management,

insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned in these Division documents which are required for the complete, fully functional and commissioned FMS.

- C. Provide a complete, neat and workmanlike installation. Use only manufacturer employees who are skilled, experienced, trained, and familiar with the specific equipment, software and configurations to be provided for this Project.
- D. The FMS Contractor shall be a recognized national manufacturer, installer and service provider of FMS. Distributors, manufacturer's representatives and wholesalers are not acceptable FMS Contractors for this project.
- E. Manage and coordinate the FMS work in a timely manner in consideration of the Project schedules. Coordinate cooperatively with the associated work of other trades so as to assist the progress and not impede or delay the work of associated trades.
- F. The FMS as provided shall incorporate, at minimum, the following integrated features, functions and services:
  - 1. Operator information, alarm management and control functions.
  - 2. Enterprise-level information and control functions.
  - 3. Information management including monitoring, transmission, archiving, retrieval, and reporting functions.
  - 4. Diagnostic monitoring and reporting of FMS functions.
  - 5. Offsite monitoring and management
  - 6. Energy management
  - 7. Indoor Air Quality monitoring and control

#### 1.05 QUALITY ASSURANCE

- A. General
  - 1. The Facility Management System Contractor shall be the primary manufacturer-owned branch office that is regularly engaged in the engineering, programming, installation and service of total integrated Facility Management Systems of similar size, scope and complexity to the FMS specified in this Contract.
  - 2. The FMS Contractor shall have a local branch facility within a 100-mile radius of the job site supplying complete maintenance and support services on a 24 hour, 7-day-a-week basis. This support facility shall have a spare parts inventory valued at a minimum of 10% of the contract value and all necessary test and diagnostic equipment required to install, commission and service the specified FMS.
  - 3. As evidence and assurance of the contractor's ability to support the Owner's system with service and parts, the contractor must have been in the FMS business for at least the last ten (10) years and have successfully completed total projects of at least 10 times the value of this contract in each of the preceding five years.
  - 4. The FMS Contractor shall be a recognized national manufacturer, installer and service provider of FMS. Distributors, manufacturer's representatives and wholesalers will not be acceptable.
  - 5. The FMS software shall be updated to the latest currently available revision at the start of Warranty.
- B. Quality Management Program
  - 1. Provide a competent and experienced FMS Project Manager employed by the FMS Contractor. The Project Manager shall be supported as necessary by other FMS Contractor employees in order to

provide professional management service for the work. The Project Manger shall be empowered to make technical, scheduling and related decisions on behalf of the FMS Contractor. At minimum, the Project Manager shall:

- a. Manage the scheduling of the work to ensure that adequate materials, labor and other resources are available as needed.
- b. Maintain the scheduling of the work and report monthly in writing to the Architect on progress.
- c. Manage the financial aspects of the FMS Contract.
- d. Coordinate with the FMS Site Supervisor and with the Architect and other trades as necessary to maintain progress of the Contract.

**1.06 REFERENCES**

- A. All work shall conform to the following Codes and Standards, as applicable:
  - 1. National Fire Protection Association (NFPA) Standards.
  - 2. National Electric Code (NEC) and applicable local Electric Code.
  - 3. Underwriters Laboratories (UL) listing and labels.
  - 4. UL 916 Energy Management
  - 5. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
  - 6. Air Movement and Control Association (AMCA).
  - 7. Institute of Electrical and Electronic Engineers (IEEE).
  - 8. Federal Communications Commission (FCC) including Part 15, Radio Frequency Devices.
  - 9. Americans Disability Act (ADA)
  
- B. In the case of conflicts or discrepancies, the more stringent regulation shall apply.
  
- C. All work shall meet the approval of the Authorities Having Jurisdiction at the project site.

**1.07 WORK BY OTHERS**

- A. The demarcation of work and responsibilities between the FMS Contractor and other related trades shall be as outlined in the FMS RESPONSIBILITY MATRIX herein

**FMS RESPONSIBILITY MATRIX**

<b>WORK</b>	<b>FURNISH</b>	<b>INSTALL</b>	<b>Low Volt. WIRING/ TUBE</b>	<b>LINE POWER</b>
_FMS low voltage and communicating wiring	FMS	FMS	FMS	N/A
Controllers for VAV Boxes	FMS	15	FMS	FMS
FMS Conduits and Raceway	FMS	FMS	FMS	FMS
Automatic Dampers	FMS	15	N/A	N/A
Manual Valves	15	15	N/A	N/A

Automatic Valves	FMS	15	FMS	FMS
VAV Boxes	15	15	N/A	N/A
Pipe insertion devices and taps including thermowells, flow and pressure stations	FMS	15	FMS	FMS
FMS Current Switches	FMS	FMS	FMS	N/A
FMS Control Relays	FMS	FMS	FMS	N/A
FMS interface with Chiller controls	FMS	FMS	FMS	FMS
Chiller and AHU controls interface with FMS	15	FMS	FMS	FMS
All FMS Nodes, equipment, housings, enclosures and panels	FMS	FMS	FMS	FMS
Smoke Detectors	16	15	16	16
Fire/Smoke Dampers	15	15	FMS	16
Fire Dampers	15	15	N/A	N/A
Chiller Flow Switches	15	15	FMS	N/A
VFDs	15	16	FMS	16
Fire alarm shutdown relay interlock wiring	16	16	16	16
Unit Heater Controls	15	FMS	FMS	16
Starters, HOA Switches	15	16	N/A	16
Control Damper Actuators	FMS	FMS	FMS	FMS

**1.08 SUBMITTALS**

- A. Shop Drawings, Product Data, and Samples
  - 1. The FMS Contractor shall submit a list of all shop drawings with submittal dates within 30 day of contract award.
  - 2. Submittals shall be in defined packages. Each package shall be complete and shall only reference itself and previously submitted packages. The packages shall be as approved by the Architect and Engineer for Contract compliance.
  - 3. Allow 15 working days for the review of each package by the Architect and Engineer in the scheduling of the total FMS work.
  - 4. Equipment and systems requiring approval of local authorities must comply with such regulations and be approved. Filing shall be at the expense of the FMS Contractor where filing is necessary. Provide a copy of all related correspondence and permits to the Owner.
  - 5. Prepare an index of all submittals and shop drawings for the installations. Index shall include a shop

drawing identification number, Contract Documents reference and item description. Submit this index prior to the submittal of any shop drawings and within 4 weeks after Contract award.

6. At a minimum, submit the following:
  - a. FMS network architecture diagrams including all nodes and interconnections.
  - b. Schematics, sequences and flow diagrams.
  - c. Points schedule for each real and virtual (software) point in the FMS, including: Tag, Point Type, System Name, Object Name, Expanded ID, Display Units, Node Type, Address, Cable Destination, Module Type, Terminal ID, Panel, Slot Number, Reference Drawing, and Cable Number.
  - d. A sample of each Graphic Display screen type and associated menu penetrations to show hierarchy and functional interrelationships.
  - e. A sample of each data visualization display type.
  - f. Detailed Bill of Material list for each Node, identifying quantity, part number, description, and optional features.
  - g. Control Damper Schedule including a separate line for each damper and a column for each of the damper attributes, including: Code Number, Fail Position, Damper Type, Damper Operator, Blade Type, Bearing Type, Seals, Duct Size, Damper Size, Mounting, and Actuator Type.
  - h. Control Valve Schedules including a separate line for each valve and a column for each of the valve attributes: Code Number, Configuration, Fail Position, Pipe Size, Valve Size, Body Configuration, Close off Pressure, Capacity, Valve CV, Calculated CV, Design Pressure, Actual Pressure, and Actuator Type.
  - i. Room Schedule including a separate line for each VAV box and terminal unit indicating minimum/maximum CFM, pickup gain, box area, and bias setting.
  - j. Details of all FMS interfaces and connections to the work of other trades.
  - k. Product data sheets for all products including software.
  - l. Training provided, including outlines for each session.

#### 1.09 RECORD DOCUMENTATION

- A. Operation and Maintenance Manuals
  1. Three (3) copies of the Operation and Maintenance Manuals shall be provided to the Owner's Representative upon completion of the project. The entire Operation and Maintenance Manual shall be furnished on Compact Disc media, and include the following for the FMS provided:
    - a. Table of contents.
    - b. As-built system record drawings. Computer Aided Drawings (CAD) record drawings shall represent the as-built condition of the system and incorporate all information supplied with the approved submittal.
    - c. Manufacturers product data sheets for all products including software.
    - d. System Operator's manuals.
    - e. Archive copy of all site-specific databases and sequences.
    - f. FMS network diagrams.
    - g. Wiring termination schedules.
    - h. Interfaces to all third-party products and work by other trades.
  2. The Operation and Maintenance Manual CD shall be self-contained, and include all necessary software required to access the project record drawings and data sheets. A logically organized table of contents shall provide dynamic links to view and print all project record drawings and product data sheets. Viewer software shall provide the ability to display, zoom, and search all documents. The CD-ROM(s) shall contain adequate space for future system updates.

- B. On-line Documentation: After completion of all the tests and adjustments listed above, the contractor shall install the following information on the FMS:
  - 1. "AS-BUILT" drawing files
  - 2. Detailed catalog data on all installed system components with address and phone number of factory repair service.
- C. Final acceptance of the FMS is to be based on owner's review of the system.
- D. FMS contractor shall provide the owner's personnel with minimum of two (2) days training.

#### 1.10 WARRANTY

- A. Standard Material and Labor Warranty
  - 1. Provide a one-year labor and material warranty on the FMS.
  - 2. If within twelve (12) months from the date of acceptance of product, upon written notice from the owner, it is found to be defective in operation, workmanship or materials, it shall be replaced, repaired or adjusted at the option of the FMS Contractor at the cost of the FMS Contractor
  - 3. Maintain an adequate supply of materials within <number of miles> of the Project site such that replacement of key parts and labor support, including programming. Warranty work shall be done during FMS Contractor's normal business hours.
  - 4. Maintain an on-site record of all work done, all items removed from site, all items returned to site, all new replacement items installed and all remedial programming and database entry work undertaken including software revisions installed. Maintain a record of all re-calibrations required as a result of Warranty service.

### **PART 2 PRODUCTS**

#### 2.01 FMS ARCHITECTURE

- A. General
  - 1. The FMS shall consist of a number of Nodes and associated equipment connected by industry standard network practices. All communication between Nodes shall be by digital means only.
  - 2. The FMS network shall at minimum comprise of the following:
    - a. Operator Workstations - fixed and portable.
    - b. Network processing, data storage and communication equipment including file servers.
    - c. Routers, bridges, switches, hubs, modems and the like communications equipment.
    - d. Active processing Nodes including field panels.
    - e. Intelligent and addressable elements and end devices.
    - f. Third-party equipment interfaces.
    - g. Other components required for a complete and working FMS.
  - 3. The FMS shall be accessible via Enterprise Intranet and Internet browser with security protection for user access.
  - 4. The FMS shall support auto-dial/auto-answer communications to allow FMS Nodes to communicate with other remote FMS Nodes via standard telephone lines.
  - 5. The PC Workstations, File servers and principal network equipment shall be standard products of recognized major manufacturers available through normal PC vendor channels. "Clones" are not acceptable.
  - 6. Provide licenses for all software residing in the FMS system and transfer these licenses to the Owner prior to completion.

- B. Network
  - 1. The FMS shall incorporate a primary Tier 1 network. At the Contractor's option, the FMS may also incorporate integrated secondary Tier 2 and tertiary Tier 3 networks.
  - 2. The FMS Network shall utilize an open architecture capable of:
    - a. Utilizing standard Ethernet communications and operate at a minimum speed of 10Mb/sec
    - b. Connecting via BACnet.
    - c. Connecting via LonMark.
  - 3. The FMS network shall support both copper and optical fiber communication media.
  
- C. Third-Party Interfaces
  - 1. FMS Contractor shall integrate real-time data from systems supplied by other trades as required in Part 3.
  - 2. The FMS system shall include necessary FMS hardware equipment and software to allow data communications between the FMS system and systems supplied by other trades.
  - 3. The trade contractor supplying other systems will provide their necessary hardware and software and will cooperate fully with the FMS contractor in a timely manner at their cost to ensure the complete data integration.
  
- D. Power Fail / Auto Restart
  - 1. Provide for the automatic orderly and predefined shutdown of parts or all of the FMS following total loss of power to parts or all of the FMS.
  - 2. Provide for the automatic orderly and predefined startup of parts or all of the FMS following total loss of power to those parts or all of the FMS. Archive and annunciate time and details of restoration.
  - 3. Provide for the orderly and predefined scheduling of controlled return to normal, automatically time scheduled, operation of controlled equipment as a result of the auto restart processes.
  - 4. Maintain the FMS real-time clock operation during periods of power outage for a minimum of 72 hours.
  
- E. Downloading and Uploading
  - 1. Provide the capability to generate FMS software-based sequences, database items and associated operational definition information and user-required revisions to same on designated OWS, and the means to download same to the associated application AN.
  - 2. Provide the capability to upload FMS operating software information, database items, sequences and alarms to the designated OWS with automatic archiving of same on the OWS.
  - 3. The functions of this Part shall be governed by the codes, approvals and regulations applying to each individual FMS application.
  
- F. FMS contractor shall provide a high speed connection from the new building to the existing building. Speed of connection and cable type to be approved by the owner.

## 2.02 OPERATOR WORKSTATION

- A. The Operator Workstations (OWS) shall provide the primary means of communication with the FMS and shall be used for operations, engineering, management, audit, reporting and other related functions.
- B. The OWS shall consist of a fixed unit as scheduled in Part 3 of this Specification. The fixed units shall consist of installed PC-based configurations.
- C. Each fixed OWS shall, at minimum, consist of:

1. PC processor with minimum 64-bit word structure.
  2. Hard drive or equal high-speed data storage.
  3. Removable high-speed data storage and export device(s) such as Read/Write CD ROM or equal.
  4. Full ASCII keyboard and digital Mouse or equal pointing device.
  5. Full color, flat screen VDU display unit, minimum 17 inches diagonal screen, minimum 1280 x 1024 resolution, 0.26 or better dot pitch and minimum 72 Hz refresh rate.
  6. Printers as scheduled in Part 3 of this Specification. Printers shall be monochromatic or full color as scheduled and designed for the functional requirements and duty of the application.
- D. All fixed OWS shall operate independently and concurrently without interference and under individual user password protection.
- E. OWS functionality shall be individually definable by software means such that OWS may be designated for specific limited users and may also be readily re-designated to provide OWS back-up to other OWSs in the FMS.

### 2.03 OPERATOR INTERFACE

- A. General
1. The FMS Operator Interface shall be user friendly, readily understood and shall make maximum use of colors, graphics, icons, embedded images, animation, text based information and data visualization techniques to enhance and simplify the use and understanding of the FMS by authorized users at the OWS.
  2. User access to the FMS shall be protected by a flexible and Owner redefinable software-based password access protection. Password protection shall be multi-level and partitionable to accommodate the varied access requirements of the different user groups. Provide the means to define unique access privileges for each individual authorized user. Provide the means to on-line manage password access control under the control of a Master Password.
  3. The Operator Interface shall incorporate comprehensive support for functions including, but not necessarily limited to, the following:
    - a. User access for selective information retrieval and control command execution
    - b. Monitoring and reporting
    - c. Alarm and non-normal condition annunciation
    - d. Selective operator override and other control actions
    - e. Information archiving, manipulation, formatting, display and reporting
    - f. FMS internal performance supervision and diagnostics
    - g. On-line access to user HELP menus
    - h. On-line access to current FMS as-built records and documentation
    - i. Means for the controlled re-programming, re-configuration of FMS operation and for the manipulation of FMS database information in compliance with the prevailing codes, approvals and regulations for individual FMS applications.
  4. Provide FMS reports and displays making maximized use of simple English language descriptions and readily understood acronyms, abbreviations and the like to assist user understanding and interpretation. All text naming conventions shall be consistent in their use and application throughout the FMS.
  5. All PC-based configurations shall operate on Microsoft(r) Windows 2000.
  6. Each fixed and portable OWS shall be on-line configurable for specific applications, functions and groups of FMS points.

- B. Alarms
1. Designated OWS shall annunciate alarms generated by the FMS. The alarm management portion of the OWS software shall, at the minimum, provide the following functions
    - a. Log date and time of alarm occurrence.
    - b. Generate a "Pop-Up" window, with audible alarm, informing a user that an alarm has been received.
    - c. Allow a user, with the appropriate security level, to acknowledge, or disable an alarm.
    - d. Provide an audit trail on hard drive for alarms by recording user acknowledgment, deletion, or disabling of an alarm. The audit trail shall include the name of the user, the alarm, the action taken on the alarm, and a time/date stamp.
  2. The FMS shall annunciate diagnostic alarms indicating system failures and non-normal operating conditions
  3. The FMS shall annunciate application alarms at minimum, as required by Part 3.
- C. Reports
1. Reports shall be generated and directed to one or more of the following: OWS display, printer, or archive at the user's option. As a minimum, the system shall provide the following reports:
    - a. All points in the FMS.
    - b. All points in each FMS application.
    - c. All points in a specific AN.
    - d. All points in a user-defined group of points.
    - e. All points currently in alarm in an FMS application.
    - f. All points locked out in an FMS application.
    - g. All FMS schedules.
    - h. All user defined and adjustable variables, schedules, interlocks and the like.
    - i. FMS diagnostic and system status reports.
  2. Provide for the generation by the user of custom reports as specified in Part 3.
  3. Provide all applicable standard reports of the FMS manufacturer.
- D. Dynamic Color Graphics
1. An unlimited number of graphic displays shall be able to be generated and executed.
  2. The graphic displays shall be able to display and provide animation based on real-time FMS data that is acquired, derived, or entered.
  3. The user shall be able to change values (setpoints) and states in system controlled equipment.
  4. Provide a graphic editing tool that allows for the creation and editing of graphic files.
  5. FMS system shall be provided with a complete user expandable symbol library containing all of the basic symbols used to represent components of a typical FMS system.
- E. Schedules
1. Provide a spreadsheet-type schedule input form for automatic FMS time-of-day scheduling and override scheduling of FMS operations shall be provided. At a minimum, the following spreadsheet types shall be accommodated:
    - a. Weekly schedules.
    - b. Temporary override schedules.
    - c. Special "Only Active If Today Is A Holiday" schedules.
    - d. Monthly schedules.
  2. Schedules shall be provided for each system or sub-system in the FMS. Each schedule shall include all commandable points residing within the system. Each point may have a unique schedule of operation relative to the system use schedule, allowing for sequential starting and control of

equipment within the system. Scheduling and rescheduling of points shall be accomplished easily via the system schedule spreadsheets.

3. Monthly calendars for a 12-month period shall be provided that allow for simplified scheduling of holidays and special days in advance. Holidays and special days shall be user-selected with the pointing device or keyboard, and shall automatically reschedule equipment operation as previously defined on the weekly schedules.

F. Historical Trending and Data Collection

1. Trend and store point history data for all FMS points and values as selected by the user.
2. The trend data shall be stored in a manner that allows custom queries and reports using industry-standard software tools.
3. At a minimum, provide the capability to perform statistical functions on the historical database:
  - a. Average.
  - b. Arithmetic mean.
  - c. Maximum/minimum values.
  - d. Range - difference between minimum and maximum values.
  - e. Standard deviation.
  - f. Sum of all values.
  - g. Variance.

2.04 APPLICATION NODES

A. General

1. The Application Nodes (AN) shall include all monitoring, control and information Nodes including field panels.
2. AN shall be programmable and governed by the requirements of their applicable codes, approvals and regulations.
3. The AN shall be designed, packaged, installed, programmed and commissioned in consideration of their specific service and prevailing operating conditions. They shall be proven standard product of their original manufacturer and not a custom product for this Project.
4. A failure at an AN shall not cause failures or non-normal operation at any other system AN other than the possible loss of active real-time information from the failed AN.
5. Ancillary AN equipment, including interfaces and power supplies, shall not be operated at more than 80% of their rated service capacity.

B. HVAC Node

1. HVAC Node shall provide both standalone and networked direct digital control of HVAC systems.
2. A dedicated HVAC Node shall be configured and provided for each primary HVAC system (air handler, chiller) and each terminal HVAC system (VAV Box, Unit Heater, Fan Coil Unit, Cabinet Heater, Fan Powered Box, CV Box)
3. Each HVAC Node shall be able to retain program, control algorithms, and setpoint information for at least 72 hours in the event of a power failure, and shall return to normal operation upon restoration of power.
4. Each HVAC Node shall report its communication status to the FMS. The FMS shall provide a system advisory upon communication failure and restoration.
5. For each primary HVAC system, provide means of indication of system performance and setpoints at, or adjacent to the HVAC Node.
6. For each primary HVAC system, provide a means to adjust setpoints and start/stop equipment at, or adjacent to the HVAC Node.
7. Provide a means to prevent unauthorized personnel from accessing setpoint adjustments and

- equipment control functions.
8. The HVAC Node shall provide the ability to download and upload configuration data, both locally at the Node and via the FMS communications network.
  9. The HVAC Node shall be provided with a permanently-mounted local graphic terminal where required in the sequences of this specification. The local graphic terminal shall provide dynamic graphical representation of the associated system status, with the ability for the operator to enter commands with proper password protection.

## 2.05 FIELD DEVICES

### A. Input Devices

1. Current Switch
  - a. Materials: Encased copper
  - b. Rating: 600vAC
  - c. Mounting: Split Core
  - d. Range: 1.5amps to 50 amps
  - e. Action: Trip point adjustment
  - f. Output: SPST, N.O.
  - g. Special: Status LED
2. Temperature Sensor - Nickel
  - a. Materials: Thin Film Nickel, White Plastic Case with Grey Plastic Base
  - b. Setpoint: Setpoint 55 to 85 degrees F, Single or Dual Adjustment, Graduated Scale (Wall Mount Only)
  - c. Mounting: Wall, Duct, Averaging, Well, Outdoor Air, Bearing, Solar
  - d. Range: -50 to 25 0 degrees F, 0 to 130 degrees F, up to 550 degrees F
  - e. Accuracy: High Precision: +/-0.34F degrees at 70 degrees F, Standard: +/-3.0F degrees at 70 degrees F
  - f. Special: Johnson Controls TE-60xx, 61xx, 63xx, 67xx Series
3. Temperature Sensors
  - a. Materials: Nickel element in a copper tube.
  - b. Mounting: Duct/Pipe, Room
  - c. Range: -50 degrees F to 250 degrees F, 55 degrees F to 85 degrees F
  - d. Accuracy: 0.1%
  - e. Output: Resistive 1000ohms at 70 degrees F
  - f. Special: Duct Element Holder, Brass Well Assembly, Room Mounting Bracket and Cover
4. Thermostat - Line Voltage
  - a. Materials: Cold Rolled Steel, Beige Thermoplastic, Sensing Element-Liquid
  - b. Contact Rating:
    - 1) 6 Ampere Running/ 36 Amps. Locked Rotor at 120 VAC
    - 2) 3.5 Amps. Running/ 21 Amps Locked Rotor at 208 VAC
    - 3) 3.0 Amps. Running/ 8 Amps Locked Rotor at 240 VAC
  - c. Fan and System Switch Rating:
    - 1) 12 Amps. Running/ 34.8 Amps. Locked Rotor at 120 VAC
    - 2) 6.9 Amps. Running/19.1 Amp. Locked Rotor at 208 VAC
    - 3) 6.0 Amps. Running/17.4 Amps Locked Rotor at 240 VAC
  - d. Mounting: Wall
  - e. Range: 40 to 90 degrees F
  - f. Accuracy: +-2 degrees F
  - g. Differential: Mechanical: Approx. 0.7F degrees

- h. Special: Johnson Controls T2x and T46 Series
- 5. Humidity Sensors
  - a. Materials: Polymer
  - b. Rating: class 2
  - c. Mounting: Duct or Wall
  - d. Range: 20% to 80%
  - e. Accuracy: +/-3%
  - f. Protection: 0-100% non-condensing
  - g. Output: 0-10vDC, 4-20mA
  - h. Special: Duct or Wall Mounting Kit
- B. Controlled Devices
  - 1. Globe Valve, Bronze Control Valve with Brass Trim, Electrically Actuated, 1/2 through 2 in.
    - a. Materials:
      - 1) Body - Cast Bronze
      - 2) Plug - Brass
      - 3) Seat - Brass Against Molded Elastomeric Disc
      - 4) Stem - Stainless Steel
      - 5) Packing - Ethylene Propylene Rubber
    - b. Rating: ANSI Class 250, fluid temp: 35 to 284 degrees F
    - c. Output Flow Maximum: 0.73 through 46.2 Cv
    - d. Special: Shall be Johnson Controls VG7000 Series Bronze Control Valves

### 3 PART PERFORMANCE / EXECUTION

#### 3.01 INSTALLATION PRACTICES

- A. FMS Wiring
  - 1. All conduit, wiring, accessories and wiring connections required for the installation of the Facility Management System, as herein specified, shall be provided by the FMS Contractor unless specifically shown on the Electrical Drawings under Division 16 Electrical. All wiring shall comply with the requirements of applicable portions of Division 16 and all local and national electric codes, unless specified otherwise in this section.
  - 2. All FMS wiring materials and installation methods shall comply with FMS manufacturer recommendations.
  - 3. The sizing type and provision of cable, conduit, cable trays, and trunking shall be the design responsibility of the FMS Contractor. If complications arise, however, due to the incorrect selection of cable, cable trays, trunking and/or conduit by the FMS Contractor, the Contractor shall be responsible for all costs incurred in replacing the selected components.
  - 4. Class 2 Wiring
    - a. All Class 2 (24VAC or less) wiring shall be installed in conduit unless otherwise specified.
    - b. Conduit is not required for Class 2 wiring in concealed accessible locations. Class 2 wiring not installed in conduit shall be supported every 5' from the building structure utilizing metal hangers designed for this application. Wiring shall be installed parallel to the building structural lines. All wiring shall be installed in accordance with local code requirements.
  - 5. Class 2 signal wiring and 24VAC power can be run in the same conduit. Power wiring 120VAC and greater cannot share the same conduit with Class 2 signal wiring.
  - 6. Perform circuit tests using qualified personnel only. Provide necessary instruments and equipment to demonstrate that:
    - a. All circuits are continuous and free from short circuits and grounds.

- b. All circuits are free from unspecified grounds; that resistance to ground of all circuits is no less than 50 megaohms.
    - c. All circuits are free from induced voltages.
  7. Provide complete testing for all cables used under this Contract. Provide all equipment, tools, and personnel as necessary to conduct these tests.
  8. Provide for complete grounding of all signal and communications cables, panels and equipment so as to ensure system integrity of operation. Ground cabling and conduit at the panel terminations. Avoid grounding loops
- B. FMS Raceway
  1. All wiring shall be installed in conduit or raceway except as noted elsewhere in this specification. Minimum control wiring conduit size 1/2".
  2. Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Architect.
  3. All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the surface to which they are attached.
  4. Flexible Metal Conduit shall be used for vibration isolation and shall be limited to 3 feet in length when terminating to vibrating equipment. Flexible Metal Conduit may be used within partition walls. Flexible Metal Conduit shall be UL listed.
- C. Penetrations
  1. Provide firestopping for all penetrations used by dedicated FMS conduits and raceways. All other project firestopping to be by other trade.
  2. All openings in fire proofed or fire stopped components shall be closed by using approved fire resistive sealant.
  3. All wiring passing through penetrations, including walls, shall be in conduit or enclosed raceway.
  4. Penetrations of floor slabs shall be by core drilling. All penetrations shall be plumb, true, and square.
  5. No penetrations in structural elements shall be made before receipt of written approval from the architect.
- D. FMS Identification Standards
  1. Node Identification. All nodes shall be identified by a permanent label fastened to the outside of the enclosure. Labels shall be suitable for the node location.
  2. Cable shall be labeled at a minimum of every 18" with the FMS System manufacturer's name and the type of signal carried within the cable, i.e. Analog Input, Analog Output, Binary Input, Binary Output, 24 VAC.
  3. Each of the cable types specified in Item A shall be of a different color coding for easy identification and troubleshooting. Recommended color coding:
    - a. Analog Input Cable Yellow
    - b. Analog Output Cable Tan
    - c. Binary Input Cable Orange
    - d. Binary Output Cable Violet
    - e. 24 VAC Cable Gray
    - f. General Purpose Cable Natural
    - g. Tier 1 Comm Cable Purple
    - h. Other Tier Comm Cable Blue
  4. Raceway Identification. All the covers to junction and pull boxes of the FMS raceways shall be painted with the appropriate color.
  5. Wire Identification. All low and line voltage FMS wiring shall be identified by a number, as referenced to the associated shop drawing and as-built drawing, at each end of the conductor or cable.

Identification number shall be permanently secured to the conductor or cable and shall be typed.

- E. FMS Node Installation
  - 1. The FMS panels and cabinets shall be located as indicated at an elevation of not less than 2 feet from the bottom edge of the panel to the finished floor. Each cabinet shall be anchored per the manufacturer's recommendations.
  - 2. The FMS contractor shall be responsible for coordinating panel locations with other trades and electrical and mechanical contractors.
- F. Input Devices
  - 1. All Input devices shall be installed per the manufacturer recommendation
  - 2.
  - 2. Locate components of the FMS in accessible local control panels wherever possible.

**3.02 COMMISSIONING**

- A. Fully commissioning all aspects of the Facility Management System work.
- B. Acceptance Check Sheet
  - 1. Prepare a check sheet that includes all points for all functions of the FMS
  - 2. Submit the check sheet to the Architect for approval one month prior to testing.
  - 3. Complete the check sheet for all items and functions of the FMS and initial each entry with time/date as record of having fully calibrated and tested the FMS. Submit to Architect.
  - 4. The Architect will use the check sheet as the basis for acceptance testing with the FMS Contractor.
- C. Provide all necessary specialist labor, materials and tools to demonstrate to the Architect a.that the FMS has been commissioned and is operating in compliance with the contract. Prepare a list of noted deficiencies signed by both the Architect and the FMS Contractor.
- D. Promptly rectify all listed deficiencies and submit to the Architect that this has been done.
- E. The Architect will retest the deficiencies in conjunction with the FMS Contractor.

**3.03 FMS SPECIFIC REQUIREMENTS**

- A. OWS Schedule

<b>ID</b>	<b>TYPE</b>	<b>LOCATION</b>	<b>FUNCTION</b>	<b>NOTES</b>
OWS1	Desktop PC	Engineering Office	HVAC	
Printer 1	Inkjet	Engineering Office	HVAC	

- 1. Air Handling Equipment
  - a. All air handlers shall be controlled with DDC controllers
  - b. All damper and valve actuation shall be electric.
- 2. Terminal Equipment

- a. Terminal Air Boxes (VAV, etc.) shall have electric damper.

### 3.04 SEQUENCES

#### A. AIR COOLED CHILLER

1. General:
  - a. Control electronically with dedicated stand-alone HVAC Node (HN).
  - b. Provide graphic display terminal mounted on the HN panel face.
  - c. Totalize runtime of the chiller.
  - d. Provide integration of chiller controls with FMS. Integration shall provide monitoring of all data available at the controller via the FMS. Install Communications Interface furnished by the chiller manufacturer. Provide all necessary wiring between communications interface and FMS.
  - e. The FMS shall monitor the common chilled water supply and return temperatures.
  - f. The two (2) chillers shall be operated in a lead-lag arrangement. Lead-lag arrangement shall be changed every week so that runtime of each chiller is approximately equal.
2. System Off:
  - a. Chiller and associated pumps shall be off.
  - b. Chiller isolation valve shall be closed.
3. System Operation:
  - a. The FMS shall monitor the position of all control valves. When there is a call for cooling in the building (any valve open) the chiller shall operate:
    - 1) The chiller isolation valve shall open.
    - 2) Associated pump shall start upon proof that isolation valve is open.
    - 3) Chiller shall be enabled to start when proof of flow has been established.
    - 4) When the chiller is enabled it will load by internal capacity controls.
    - 5) Two (2) chillers shall be sequenced in a lead-lag arrangement to maintain setpoint.
  - b. The chiller shall operate for a minimum of 15 minutes (adj.).
4. System Stop:
  - a. When there is no call for cooling and/or all air handling units are de-energized:
    - 1) Chiller shall be disabled.
    - 2) Associated chilled water pump shall continue to run for 2 minutes (adj.) after chiller shutdown and then be stopped.
    - 3) Associated isolation valve shall close when the chilled water pump is stopped.
  - b. Chiller shall remain off for a minimum of 15 minutes (adj.).
5. Safeties and Alarms:
  - a. The chiller microprocessor shall annunciate discrete alarm conditions.
  - b. When a chiller alarm is initiated, the discrete alarm condition causing the alarm shall be annunciated at the operator workstation.
  - c. Annunciate off-normal alarm whenever chiller status does not equal command.
  - d. Refer also to the Point List.
6. Failure Modes:
  - a. Chiller Failure: If a chiller fails to operate, the chiller shall be disabled and alarm shall be annunciated. Associated pump shall be stopped and isolation valve shall close.
  - b. Pump Failure: If a pump fails to operate, its associated chiller shall shut down and alarm shall be annunciated at the operator workstation. Pump shall be disabled and isolation valve shall close.
  - c. Chiller Isolation Valve Failure: If the chiller isolation valve fails to operate, its associated chiller shall shut down and alarm shall be annunciated at the operator workstation. Isolation valve shall close and pump shall stop.
  - d. Sensor Failure: Upon the failure of an internal analog sensor, the chiller operating controls shall shutdown the chiller. Upon the failure of an FMS analog sensor, an alarm will be annunciated at

the operator workstation.

- B. Primary Loop Chilled Water Constant Flow - 2 Pumps per Chiller
1. General:
    - a. Control electronically with dedicated stand-alone HVAC Node (HN).
    - b. Provide graphic display terminal mounted on the HN panel face.
    - c. Totalize runtime of the chilled water pumps and alternate lead pump every 168 hours of operation (adj.).
  2. System Off:
    - a. The chilled water pumps shall be off.
  3. System Start:
    - a. When the outdoor air temperature rises above the cooling system enable setpoint (65 degrees F, adj.), the lead chilled water pump (operator selectable) shall start.
    - b. A pump shall operate for a minimum of 15 minutes (adj.).
  4. System Run:
    - a. The lead chilled water pump shall run continuously.
  5. System Stop:
    - a. When the outdoor air temperature falls below the cooling system enable setpoint (65 degrees F, adj.), the chilled water pumps shall stop.
  6. Safeties and Alarms:
    - a. Annunciate off-normal alarm whenever pump status does not equal command.
    - b. Refer also to Point List.
  7. Failure Mode:
    - a. Pump Failure: If a pump fails to operate, the lag pump shall be started, the failed pump shall be disabled, and alarm shall be annunciated.
- C. Mixed Air Single Path Variable Volume Electric/Chilled Water Indoor Air Handling Unit
1. General:
    - a. Control electronically with dedicated stand-alone HVAC Node (HN).
    - b. Provide graphic display terminal mounted on the HN panel face.
    - c. The system shall operate on a timed-programmed basis as determined by the system operator (initially set to start at 7:30 AM and stop at 6:30 PM, Monday-Friday).
  2. System Off:
    - a. The supply and return fans shall be off.
    - b. The outside air damper shall be closed.
    - c. The return air damper shall be open.
    - d. The cooling coil valve shall be closed.
    - e. The electric heating shall be off.
  3. System Start:
    - a. When the air-handling unit is indexed to operate, the supply fan shall start first. NOTE: The mixed air dampers and the supply fan speed drive shall be ramped to their respective operating values over a time period (adj., initially set to 5 minutes).
    - b. Upon proof of supply fan operation, dampers and cooling coil valve shall be indexed to their "System Run" conditions.
    - c. The air handler shall be commanded on during the unoccupied mode when any of the associated zones is outside unoccupied setpoint temperature.
  4. System On:
    - a. Unoccupied Heating Mode:
      - 1) Supply Fan: Supply fan shall cycle to maintain space temperature at the unoccupied heating setpoint (adj.). The supply fan shall be controlled to maintain duct static pressure at

- setpoint (adj., initially set to 2.5" w.c. pa). the supply fan.
- 2) Economizer Dampers: Outside air damper is fully closed and return air damper is fully open.
  - 3) Electric heating: Heating shall be staged on when room temperature drops below night setpoint.
  - 4) Cooling Coil Valve: Fully closed.
- b. Unoccupied Cooling Mode:
- 1) Supply Fan: Supply fan shall cycle to maintain space temperature at the unoccupied heating setpoint (adj.). The supply fan shall be controlled to maintain duct static pressure at setpoint (adj., initially set to 2.5" w.c. pa).
  - 2) Economizer Dampers: Economizer dampers shall be enabled to provide free cooling when the outside air temperature is below the dry bulb economizer setpoint.
- c. Economizer Available: Outside air and exhaust dampers are fully open and return air damper is fully closed when the supply fan are on.
- d. Economizer Not Available: Outside air and exhaust dampers are fully closed and return air damper is fully open.
- 1) Cooling Coil Valve: Modulating when fans are on to maintain unoccupied temperature setpoint.
  - 2) Electric heating shall be turned off.
- e. Warm-up Mode:
- 1) Supply Fan: Supply fan shall start and run continuously. The supply fan speed shall be controlled to maintain duct static pressure setpoint.
  - 2) Economizer Dampers: Outside air damper is fully closed and return air damper is fully open.
  - 3) Electric heating: Heating shall be staged on to bring supply air temperature to setpoint.
  - 4) Cooling Coil Valve: Fully closed.
- f. Cool-down Mode:
- 1) Supply Fan: Supply fan shall start and run continuously. The supply fan speed shall be controlled to maintain duct static pressure setpoint.
  - 2) Electric heating: Electric heating shall be turned off.
  - 3) Economizer Dampers: Economizer dampers shall be enabled to provide free cooling when the outside air temperature is below the dry bulb economizer setpoint.
- a) Economizer Available: Economizer dampers shall modulate subject to a mixed air low limit of 40 degrees F (adj.).
  - b) Economizer Not Available: Outside air damper is fully closed and return air damper is fully open.
- 4) Cooling Coil Valve: Modulate in sequence with the economizer dampers to maintain the discharge air temperature at setpoint as reset by space temperature.
- g. Occupied Mode:
- 1) Supply Fan: Supply fan shall start and run continuously. The supply fan speed shall be controlled to maintain duct static pressure setpoint.
  - 2) Economizer Dampers: Economizer dampers shall be enabled to provide free cooling when the outside air temperature is below the dry bulb economizer setpoint.
    - a) Economizer Available: Economizer dampers shall modulate subject to a mixed air low limit of 40 degrees F (adj.).
    - b) Economizer Not Available: The economizer dampers shall maintain a minimum outside air damper position (adj.).
  - 3) Outside air damper shall modulate to maintain 800 ppm CO<sup>2</sup> in the space.

- 4) Heating Mode: In the heating mode, the electric heating shall be controlled to the calculated discharge air setpoint as determined by the error between the actual zone temperature and the zone temperature setpoint of 72 degrees F (adjustable).
  - 5) Cooling Coil Valve: Modulate in sequence with the economizer dampers and electric heating to maintain discharge air temperature setpoint as reset by space temperature.
  5. System Stop:
    - a. When the air-handling unit is indexed to shut down, the supply and exhaust fans shall stop.
    - b. Dampers and control valve shall be indexed to their "System Off" conditions.
    - c. Electric heating shall shut down.
  6. Safeties and Alarms:
    - a. Smoke Control:
      - 1) Duct smoke detector(s) shall stop the supply and exhaust fans and annunciate alarm when products of combustion are detected in the air stream. Dampers and control valve shall be indexed to their "System Off" conditions.
      - 2) The supply and exhaust fans shall be interlocked to shut down upon a command from the building fire alarm system.
      - 3) Upon a return to normal, the supply and exhaust fans shall start after an adjustable delay to provide a staggered start of all building loads.
    - b. Filter Condition: Monitor differential pressure across filter and annunciate alarm when differential pressure setpoint (adj.) is exceeded.
    - c. Low limit: Manual reset low limit thermostat shall stop the supply and exhaust fans, close the outdoor air dampers, fully stage the electric heating on and annunciate alarm should the coil discharge air temperature fall below 38 degrees F.
    - d. High Limit: Manual reset high limit thermostat located in the return air shall stop the supply and exhaust fans and annunciate alarm should the return air temperature rise above 125 degrees F. Dampers and shall be indexed to their "System Off" conditions.
    - e. Fan Volume Control: The variable speed drive on the supply and exhaust fans shall be modulated by a static pressure sensor located in the discharge plenum of the supply fan and a proportional plus integral control shall provide a control signal to the system to provide a static pressure of 2.5" w.g. (adj.) at that point.
    - f. Static High Limit: The static high limit sensor located in the discharge of the supply fan shall shut down the unit and annunciate alarm if discharge static exceeds 3" w.g.(adj.).
  7. Failure Modes:
    - a. Fan Failure: If the supply or exhaust fan fails to operate, both fans shall shut down and alarm shall be annunciated. Dampers and control valve shall be indexed to their "System Off" conditions.
    - b. Sensor Failure: Upon the failure of an analog sensor, associated dampers and control valve shall remain at their last position and alarm shall be annunciated.
    - c. Power Failure:
      - 1) Fans: Upon restoration of power, the supply and return fans shall start after an adjustable delay to provide a staggered start of all building loads.
      - 2) Dampers: Economizer dampers shall be provided with spring return actuators to fail to their "System Off" positions
      - 3) Valves: Cooling valve shall be provided with spring return actuator to fail closed to the coil.
- D. Fan Powered Terminal Unit with Electric Reheat
1. General:
    - a. Terminal unit control dedicated to individual zones using fan powered electric reheat to condition the zone.
  2. System Off:

- a. The electric heat shall be stopped.
  - b. The damper shall move to the closed position.
  - c. The fan will go to the off position.
  3. System Start:
    - a. The fan powered terminal units shall be energized when the air handling unit serving the unit is energized, or when the DDC system indicates night low limit operation.
  4. System On:
    - a. The terminal unit fan shall run continuously when the unit is energized.
    - b. The primary air flow shall be controlled in response to room temperature. The primary air flow shall have maximum and minimum settings.
    - c. The unit shall increase primary air flow upon a rise in room temperature above the setpoint.
    - d. As the room temperature falls below setpoint the primary air is modulated to its minimum position.
    - e. Upon a further fall in room temperature, the electric heat shall energize to maintain room setpoint.
  5. System Stop:
    - a. The electric heat shall be stopped.
    - b. The damper shall move to the closed position.
    - c. The fan shall move to the off mode.
  6. Safeties and Alarms:
    - a. An alarm shall be noted in the event of a low and/or high temperature limit in the zone sensor.
    - b. Refer also to Point List.
  7. Failure Mode:
    - a. The terminal unit heat shall fail to the off position.
    - b. The terminal unit damper shall fail to the open position
    - c. The fan shall fail to the off position.
- E. Steam Duct Humidifier
1. General:
    - a. Control electronically with dedicated stand-alone HVAC Node (HN).
    - b. Humidity monitored by duct humidity sensor and controlled by a staged or modulating control valve.
    - c. Strap on sensor shall open jacket valve to maintain jacket temperature if applicable.
    - d. Provide graphic display at workstation.
  2. System Off:
    - a. The steam valve shall remain closed.
  3. System Start:
    - a. Upon proof of airflow, system will be enabled to operate.
    - b. When the duct humidity falls below 50% relative humidity (adj.) control valve and jacket valve shall modulate or stage open.
  4. System Run:
    - a. Humidity valve shall modulate or stage to maintain adjustable humidity setpoint of 55% relative humidity.
  5. System Stop:
    - a. When duct humidity rises above an adjustable setpoint of 60% relative humidity control valve shall modulate closed.
  6. Safeties and Alarms:
    - a. Humidity valve shall be prevented from operating until positive proof of airflow.
    - b. Humidity High Limit: Sensor located downstream from humidifier shall close control valve upon exceeding high humidity limit. Safety can be reset either manually or automatically depending

- on type of sensor chosen.
- c. Alarm may be sent to workstation upon high humidity shutdown.
- d. Refer also to Point List.
- 7. Failure Modes:
  - a. If humidification control valve fails to operate or receive signal, the control valve shall return to the closed position and alarm may be annunciated.
  
- F. Exhaust Fan Occupied/Unoccupied Control
  - 1. General:
    - a. The exhaust fan shall run in different modes when in occupied or unoccupied control.
  - 2. System Off:
    - a. The exhaust fan shall be in the off mode.
  - 3. System Start:
    - a. Upon a signal from the FMS system the fan shall start.
  - 4. System On:
    - a. Upon a call from the FMS the system fan shall start during occupied hours of the day.
  - 5. System Stop:
    - a. The fan shall stop during unoccupied hours set by the FMS.
  - 6. Safeties and Alarms:
    - a. The system shall have a manual override switch to turn the system on during unoccupied hours.
    - b. Refer also to Point List.
  - 7. Failure Modes:
    - a. The fan shall fail to the closed position.
  
- G. Exhaust Fan Temperature Control Direct Digital Control
  - 1. General:
    - a. Exhaust fan control to maintain a thermostat setpoint throughout the space with direct digital control.
  - 2. System Off:
    - a. The fan shall move switch to the off position.
  - 3. System Start:
    - a. Upon a signal from the exhaust fan shall start to maintain a thermostat setpoint.
  - 4. System On:
    - a. The exhaust/supply fan shall be started and stopped through the automation system through the auxiliary contacts of the associated air handling unit.
  - 5. System Stop:
    - a. The fan shall move to the off position.
  - 6. Safeties and Alarms:
    - a. Wall switch: The exhaust/supply fans shall also be started and stopped from a standard wall switch. This switch will override the fan "on" or "off" from the space and bypass the automatic operation with the air handling unit.
    - b. FACP: The fire alarm control system shall be started and stopped from the fire alarm control panel.
    - c. Refer also to Point List.
  - 7. Failure Modes:
    - a. The fan shall fail to the off position.

3.05 POINTS LIST (see attached)

**END OF SECTION**







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## SECTION 15150 - (ALTERNATE) AUTOMATIC CONTROLS

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. All work of this Division shall be coordinated and provided by the single Facilities Management System (FMS) Contractor.
- B. The work of this Division shall be scheduled, coordinated, and interfaced with the associated work of other trades. Reference the Specifications Documents for details.
- C. The work of this Division shall be as required by the Specifications, Point Schedules and Drawings.
- D. If the FMS Contractor believes there are conflicts or missing information in the project documents, the Contractor shall promptly request clarification and instruction from the design team.

#### 1.02 DEFINITIONS

- A. Analog: A continuously variable system or value not having discrete levels. Typically exists within a defined range of limiting values.
- B. Binary: A two-state system where an "ON" condition is represented by one discrete signal level and an "OFF" condition is represented by a second discrete signal level each separated by a defined deadband.
- C. Facility Management System (FMS): The total integrated system of fully operational and functional elements, including equipment, software, programming, and associated materials, to be provided by this Division FMS Contractor and to be interfaced to the associated work of other related trades.
- D. FMS Contractor: The single Contractor to provide the work of this Division. This Contractor shall be the primary manufacturer, installer, commissioner and ongoing service provider for the FMS work.
- E. Control Sequence: An FMS pre-programmed arrangement of software algorithms, logical computation, target values and limits as required to attain the defined operational control objectives.
- F. Direct Digital Control: The digital algorithms and pre-defined arrangements included in the FMS software to provide direct closed-loop control for the designated equipment and controlled variables. Inclusive of Proportional, Derivative and Integral control algorithms together with target values, limits, logical functions, arithmetic functions, constant values, timing considerations and the like.

- G. FMS Network: The total digital on-line real-time interconnected configuration of FMS digital processing units, workstations, panels, sub-panels, controllers, devices and associated elements individually known as network nodes. May exist as one or more fully interfaced and integrated sub-networks, LAN, WAN or the like.
- H. Node: A digitally programmable entity existing on the FMS network.
- I. FMS Integration: The complete functional and operational interconnection and interfacing of all FMS work elements and nodes in compliance with all applicable codes, standards and ordinances so as to provide a single coherent FMS as required by this Division.
- J. Provide: The term "Provide" and its derivatives when used in this Division shall mean to furnish, install in place, connect, calibrate, test, commission, warrant, document and supply the associated required services ready for operation.
- K. PC: IBM-compatible Personal Computer from a recognized major manufacturer. PC "clones" are not acceptable.
- L. Furnish: The term "Furnish" and its derivatives when used in this Division shall mean supply at the FMS Contractor's cost to the designated third party trade contractor for installation. FMS Contractor shall connect furnished items to the FMS, calibrate, test, commission, warrant and document.
- M. Wiring: The term "Wiring" and its derivatives when used in this Division shall mean provide the FMS wiring and terminations.
- N. Install: The term "Install" and its derivatives when used in this Division shall mean receive at the jobsite and mount.
- O. Protocol: The term "protocol" and its derivatives when used in this Division shall mean a defined set of rules and standards governing the on-line exchange of data between FMS network nodes.
- P. Software: The term "software" and its derivatives when used in this Division shall mean all of programmed digital processor software, preprogrammed firmware and project specific digital process programming and database entries and definitions as generally understood in the FMS industry for real-time, on-line, integrated FMS configurations.
- Q. The use of words in the singular in these Division documents shall not be considered as limiting when other indications in these documents denote that more than one such item is being referenced.
- R. Headings, paragraph numbers, titles, shading, bolding, underscores, clouds and other symbolic interpretation aids included in the Division documents are for general information only and are to assist in the reading and interpretation of these Documents. They do not form a formal part of the Documents and may not be consistent or complete in their use throughout the Documents.

#### 1.03 CONTRACTOR QUALIFICATIONS

- A. Qualified Bidders: Johnson Controls- Metasys. Phone: 770-870-3931

1.04 FMS DESCRIPTION

- A. The work of the single FMS Contractor shall be as defined individually and collectively in all Sections of this Division specifications together with the associated Point Sheets and Drawings and the associated interfacing work as referenced in the related documents as are listed in Part 1 of this Section.
- B. The FMS work shall consist of the provision of all labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned in these Division documents which are required for the complete, fully functional and commissioned FMS.
- C. Provide a complete, neat and workmanlike installation. Use only manufacturer employees who are skilled, experienced, trained, and familiar with the specific equipment, software and configurations to be provided for this Project.
- D. The FMS Contractor shall be a recognized national manufacturer, installer and service provider of FMS. Distributors, manufacturer's representatives and wholesalers are not acceptable FMS Contractors for this project.
- E. Manage and coordinate the FMS work in a timely manner in consideration of the Project schedules. Coordinate cooperatively with the associated work of other trades so as to assist the progress and not impede or delay the work of associated trades.
- F. The FMS as provided shall incorporate, at minimum, the following integrated features, functions and services:
  - 1. Operator information, alarm management and control functions.
  - 2. Enterprise-level information and control functions.
  - 3. Information management including monitoring, transmission, archiving, retrieval, and reporting functions.
  - 4. Diagnostic monitoring and reporting of FMS functions.
  - 5. Offsite monitoring and management
  - 6. Energy management
  - 7. Indoor Air Quality monitoring and control

1.05 QUALITY ASSURANCE

- A. General
  - 1. The Facility Management System Contractor shall be the primary manufacturer-owned branch office that is regularly engaged in the engineering, programming, installation and service of total integrated Facility Management Systems of similar size, scope and complexity to the FMS specified in this Contract.
  - 2. The FMS Contractor shall have a local branch facility within a 100-mile radius of the job site supplying complete maintenance and support services on a 24 hour, 7-day-a-week basis. This support facility shall have a spare parts inventory valued at a minimum of 10% of the contract value and all necessary test and diagnostic equipment required to install, commission and service the specified FMS.

3. As evidence and assurance of the contractor's ability to support the Owner's system with service and parts, the contractor must have been in the FMS business for at least the last ten (10) years and have successfully completed total projects of at least 10 times the value of this contract in each of the preceding five years.
  4. The FMS Contractor shall be a recognized national manufacturer, installer and service provider of FMS. Distributors, manufacturer's representatives and wholesalers will not be acceptable.
  5. The FMS software shall be updated to the latest currently available revision at the start of Warranty.
- B. Quality Management Program
1. Provide a competent and experienced FMS Project Manager employed by the FMS Contractor. The Project Manager shall be supported as necessary by other FMS Contractor employees in order to provide professional management service for the work. The Project Manger shall be empowered to make technical, scheduling and related decisions on behalf of the FMS Contractor. At minimum, the Project Manager shall:
    - a. Manage the scheduling of the work to ensure that adequate materials, labor and other resources are available as needed.
    - b. Maintain the scheduling of the work and report monthly in writing to the Architect on progress.
    - c. Manage the financial aspects of the FMS Contract.
    - d. Coordinate with the FMS Site Supervisor and with the Architect and other trades as necessary to maintain progress of the Contract.

#### 1.06 REFERENCES

- A. All work shall conform to the following Codes and Standards, as applicable:
1. National Fire Protection Association (NFPA) Standards.
  2. National Electric Code (NEC) and applicable local Electric Code.
  3. Underwriters Laboratories (UL) listing and labels.
  4. UL 916 Energy Management
  5. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
  6. Air Movement and Control Association (AMCA).
  7. Institute of Electrical and Electronic Engineers (IEEE).
  8. Federal Communications Commission (FCC) including Part 15, Radio Frequency Devices.
  9. Americans Disability Act (ADA)
- B. In the case of conflicts or discrepancies, the more stringent regulation shall apply.
- C. All work shall meet the approval of the Authorities Having Jurisdiction at the project site.

#### 1.07 WORK BY OTHERS

- A. The demarcation of work and responsibilities between the FMS Contractor and other related trades shall be as outlined in the FMS RESPONSIBILITY MATRIX herein.

FMS RESPONSIBILITY MATRIX

WORK	FURNISH	INSTALL	Low Volt. WIRING/ TUBE	LINE POWER
FMS low voltage and communicating wiring	FMS	FMS	FMS	N/A
Controllers for VAV Boxes	FMS	15	FMS	FMS
FMS Conduits and Raceway	FMS	FMS	FMS	FMS
RTU Automatic Dampers/Actuators	15	15	N/A	N/A
Manual Valves	15	15	N/A	N/A
Automatic Valves	FMS	15	FMS	FMS
VAV Boxes	15	15	N/A	N/A
Pipe insertion devices and taps including thermowells, flow and pressure stations	FMS	15	FMS	FMS
FMS Current Switches	FMS	FMS	FMS	N/A
FMS Control Relays	FMS	FMS	FMS	N/A
All FMS Nodes, equipment, housings, enclosures and panels	FMS	FMS	FMS	FMS
Smoke Detectors	16	15	16	16
Fire/Smoke Dampers	15	15	FMS	16
Fire Dampers	15	15	N/A	N/A
VFDs	15	16	FMS	16
Fire alarm shutdown relay interlock wiring	16	16	16	16
Unit Heater Controls	15	FMS	FMS	16
Starters, HOA Switches	15	16	N/A	16
Control Damper Actuators	FMS	FMS	FMS	FMS

1.08 SUBMITTALS

- A. Shop Drawings, Product Data, and Samples
  - 1. The FMS Contractor shall submit a list of all shop drawings with submittal dates within 30 day of contract award.
  - 2. Submittals shall be in defined packages. Each package shall be complete and shall only reference itself and previously submitted packages. The packages shall be as approved by the Architect and Engineer for Contract compliance.

3. Allow 15 working days for the review of each package by the Architect and Engineer in the scheduling of the total FMS work.
4. Equipment and systems requiring approval of local authorities must comply with such regulations and be approved. Filing shall be at the expense of the FMS Contractor where filing is necessary. Provide a copy of all related correspondence and permits to the Owner.
5. Prepare an index of all submittals and shop drawings for the installations. Index shall include a shop drawing identification number, Contract Documents reference and item description. Submit this index prior to the submittal of any shop drawings and within 4 weeks after Contract award.
6. At a minimum, submit the following:
  - a. FMS network architecture diagrams including all nodes and interconnections.
  - b. Schematics, sequences and flow diagrams.
  - c. Points schedule for each real and virtual (software) point in the FMS, including: Tag, Point Type, System Name, Object Name, Expanded ID, Display Units, Node Type, Address, Cable Destination, Module Type, Terminal ID, Panel, Slot Number, Reference Drawing, and Cable Number.
  - d. A sample of each Graphic Display screen type and associated menu penetrations to show hierarchy and functional interrelationships.
  - e. A sample of each data visualization display type.
  - f. Detailed Bill of Material list for each Node, identifying quantity, part number, description, and optional features.
  - g. Control Damper Schedule including a separate line for each damper and a column for each of the damper attributes, including: Code Number, Fail Position, Damper Type, Damper Operator, Blade Type, Bearing Type, Seals, Duct Size, Damper Size, Mounting, and Actuator Type.
  - h. Control Valve Schedules including a separate line for each valve and a column for each of the valve attributes: Code Number, Configuration, Fail Position, Pipe Size, Valve Size, Body Configuration, Close off Pressure, Capacity, Valve CV, Calculated CV, Design Pressure, Actual Pressure, and Actuator Type.
  - i. Room Schedule including a separate line for each VAV box and terminal unit indicating minimum/maximum CFM, pickup gain, box area, and bias setting.
  - j. Details of all FMS interfaces and connections to the work of other trades.
  - k. Product data sheets for all products including software.
  - l. Training provided, including outlines for each session.

#### 1.09 RECORD DOCUMENTATION

- A. Operation and Maintenance Manuals
  1. Three (3) copies of the Operation and Maintenance Manuals shall be provided to the Owner's Representative upon completion of the project. The entire Operation and Maintenance Manual shall be furnished on Compact Disc media, and include the following for the FMS provided:
    - a. Table of contents.
    - b. As-built system record drawings. Computer Aided Drawings (CAD) record drawings shall represent the as-built condition of the system and incorporate all information supplied with the approved submittal.
    - c. Manufacturers product data sheets for all products including software.
    - d. System Operator's manuals.
    - e. Archive copy of all site-specific databases and sequences.
    - f. FMS network diagrams.
  - g. Wiring termination schedules.
  - h. Interfaces to all third-party products and work by other trades.

2. The Operation and Maintenance Manual CD shall be self-contained, and include all necessary software required to access the project record drawings and data sheets. A logically organized table of contents shall provide dynamic links to view and print all project record drawings and product data sheets. Viewer software shall provide the ability to display, zoom, and search all documents. The CD-ROM(s) shall contain adequate space for future system updates.
- B. On-line Documentation: After completion of all the tests and adjustments listed above, the contractor shall install the following information on the FMS:
1. "AS-BUILT" drawing files
  2. Detailed catalog data on all installed system components with address and phone number of factory repair service.

#### 1.10 WARRANTY

- A. Standard Material and Labor Warranty
1. Provide a one-year labor and material warranty on the FMS.
  2. If within twelve (12) months from the date of acceptance of product, upon written notice from the owner, it is found to be defective in operation, workmanship or materials, it shall be replaced, repaired or adjusted at the option of the FMS Contractor at the cost of the FMS Contractor
  3. Maintain an adequate supply of materials within 30 miles of the Project site for replacement of key parts and labor support, including programming. Warranty work shall be done during FMS Contractor's normal business hours.
  4. Maintain an on-site record of all work done, all items removed from site, all items returned to site, all new replacement items installed and all remedial programming and database entry work undertaken including software revisions installed. Maintain a record of all re-calibrations required as a result of Warranty service.

### **PART 2 PRODUCTS**

#### 2.01 FMS ARCHITECTURE

- A. General
1. The FMS shall consist of a number of Nodes and associated equipment connected by industry standard network practices. All communication between Nodes shall be by digital means only.
  2. The FMS network shall at minimum comprise of the following:
    - a. Operator Workstations - fixed and portable.
    - b. Network processing, data storage and communication equipment including file servers.
    - c. Routers, bridges, switches, hubs, modems and the like communications equipment.
    - d. Active processing Nodes including field panels.
    - e. Intelligent and addressable elements and end devices.
    - f. Third-party equipment interfaces.
    - g. Other components required for a complete and working FMS.
  3. The FMS shall be accessible via Enterprise Intranet and Internet browser with security protection for user access.
  4. The FMS shall support auto-dial/auto-answer communications to allow FMS Nodes to communicate with other remote FMS Nodes via standard telephone lines.
  5. The PC Workstations, File servers and principal network equipment shall be standard products of recognized major manufacturers available through normal PC vendor channels. "Clones" are not acceptable.

6. Provide licenses for all software residing in the FMS system and transfer these licenses to the Owner prior to completion.
- B. Network
1. The FMS shall incorporate a primary Tier 1 network. At the Contractor's option, the FMS may also incorporate integrated secondary Tier 2 and tertiary Tier 3 networks.
  2. The FMS Network shall utilize an open architecture capable of:
    - a. Utilizing standard Ethernet communications and operate at a minimum speed of 10Mb/sec
    - b. Connecting via BACnet.
    - c. Connecting via LonMark.
  3. The FMS network shall support both copper and optical fiber communication media.
- C. Third-Party Interfaces
1. FMS Contractor shall integrate real-time data from systems supplied by other trades as required in Part 3.
  2. The FMS system shall include necessary FMS hardware equipment and software to allow data communications between the FMS system and systems supplied by other trades.
  3. The trade contractor supplying other systems will provide their necessary hardware and software and will cooperate fully with the FMS contractor in a timely manner at their cost to ensure the complete data integration.
- D. Power Fail / Auto Restart
1. Provide for the automatic orderly and predefined shutdown of parts or all of the FMS following total loss of power to parts or all of the FMS.
  2. Provide for the automatic orderly and predefined startup of parts or all of the FMS following total loss of power to those parts or all of the FMS. Archive and annunciate time and details of restoration.
  3. Provide for the orderly and predefined scheduling of controlled return to normal, automatically time scheduled, operation of controlled equipment as a result of the auto restart processes.
  4. Maintain the FMS real-time clock operation during periods of power outage for a minimum of 72 hours.
- E. Downloading and Uploading
1. Provide the capability to generate FMS software-based sequences, database items and associated operational definition information and user-required revisions to same on designated OWS, and the means to download same to the associated application AN.
  2. Provide the capability to upload FMS operating software information, database items, sequences and alarms to the designated OWS with automatic archiving of same on the OWS.
  3. The functions of this Part shall be governed by the codes, approvals and regulations applying to each individual FMS application.

**2.02 OPERATOR WORKSTATION**

- A. The FMS Contractor shall provide (1) workstation, (1) printer, and (1) data port in the main mechanical room (near the engineer's desk area). The Operator Workstations (OWS) shall provide the primary means of communication with the FMS and shall be used for operations, engineering, management, audit, reporting, and other related functions. The workstation and printer shall be as described in "B" below.
- B. Each fixed OWS shall, at minimum, consist of:
  - 1. PC processor with minimum 64-bit word structure.
  - 2. Hard drive or equal high-speed data storage. (min. 40 gigabytes)
  - 3. Min. 1024 megabyte RAM.
  - 4. Removable high-speed data storage and export device(s) such as Read/Write CD ROM or equal.
  - 5. Full ASCII keyboard and digital Mouse or equal pointing device.
  - 6. Full color, flat screen VDU display unit, minimum 19 inches diagonal screen, minimum 1280 x 1024 resolution, 0.26 or better dot pitch and minimum 72 Hz refresh rate.
  - 7. InkJet printer (min. 12 pages/minute). HP Color DeskJet 9800 or equal.
- C. All fixed OWS shall operate independently and concurrently without interference and under individual user password protection.
- D. OWS functionality shall be individually definable by software means such that OWS may be designated for specific limited users and may also be readily re-designated to provide OWS back-up to other OWS's in the FMS.

**2.03 OPERATOR INTERFACE**

- A. General
  - 1. The FMS Operator Interface shall be user friendly, readily understood and shall make maximum use of colors, graphics, icons, embedded images, animation, text based information and data visualization techniques to enhance and simplify the use and understanding of the FMS by authorized users at the OWS.
  - 2. User access to the FMS shall be protected by a flexible and Owner redefinable software-based password access protection. Password protection shall be multi-level and partitionable to accommodate the varied access requirements of the different user groups. Provide the means to define unique access privileges for each individual authorized user. Provide the means to on-line manage password access control under the control of a Master Password.
  - 3. The Operator Interface shall incorporate comprehensive support for functions including, but not necessarily limited to, the following:
    - a. User access for selective information retrieval and control command execution
    - b. Monitoring and reporting
    - c. Alarm and non-normal condition annunciation
    - d. Selective operator override and other control actions
    - e. Information archiving, manipulation, formatting, display and reporting
    - f. FMS internal performance supervision and diagnostics
    - g. On-line access to user HELP menus
    - h. On-line access to current FMS as-built records and documentation
  - i. Means for the controlled re-programming, re-configuration of FMS operation and for the manipulation of FMS database information in compliance with the prevailing codes, approvals

- and regulations for individual FMS applications.
4. Provide FMS reports and displays making maximized use of simple English language descriptions and readily understood acronyms, abbreviations and the like to assist user understanding and interpretation. All text naming conventions shall be consistent in their use and application throughout the FMS.
  5. All PC-based configurations shall operate on Microsoft(r) Windows 2000.
  6. Each fixed and portable OWS shall be on-line configurable for specific applications, functions and groups of FMS points.
- B. Alarms
1. Designated OWS shall annunciate alarms generated by the FMS. The alarm management portion of the OWS software shall, at the minimum, provide the following functions
    - a. Log date and time of alarm occurrence.
    - b. Generate a "Pop-Up" window, with audible alarm, informing a user that an alarm has been received.
    - c. Allow a user, with the appropriate security level, to acknowledge, or disable an alarm.
    - d. Provide an audit trail on hard drive for alarms by recording user acknowledgment, deletion, or disabling of an alarm. The audit trail shall include the name of the user, the alarm, the action taken on the alarm, and a time/date stamp.
  2. The FMS shall annunciate diagnostic alarms indicating system failures and non-normal operating conditions
  3. The FMS shall annunciate application alarms at minimum, as required by Part 3.
- C. Reports
1. Reports shall be generated and directed to one or more of the following: OWS display, printer, or archive at the user's option. As a minimum , the system shall provide the following reports:
    - a. All points in the FMS.
    - b. All points in each FMS application.
    - c. All points in a specific AN.
    - d. All points in a user-defined group of points.
    - e. All points currently in alarm in an FMS application.
    - f. All points locked out in an FMS application.
    - g. All FMS schedules.
    - h. All user defined and adjustable variables, schedules, interlocks and the like.
    - i. FMS diagnostic and system status reports.
  2. Provide for the generation by the user of custom reports as specified in Part 3.
  3. Provide all applicable standard reports of the FMS manufacturer.
- D. Dynamic Color Graphics
1. An unlimited number of graphic displays shall be able to be generated and executed.
  2. The graphic displays shall be able to display and provide animation based on real-time FMS data that is acquired, derived, or entered.
  3. The user shall be able to change values (setpoints) and states in system controlled equipment.
  4. Provide a graphic editing tool that allows for the creation and editing of graphic files.
  5. FMS system shall be provided with a complete user expandable symbol library containing all of the basic symbols used to represent components of a typical FMS system.
- E. Schedules
1. Provide a spreadsheet-type schedule input form for automatic FMS time-of-day scheduling and

override scheduling of FMS operations shall be provided. At a minimum, the following spreadsheet types shall be accommodated:

- a. Weekly schedules.
  - b. Temporary override schedules.
  - c. Special "Only Active If Today Is A Holiday" schedules.
  - d. Monthly schedules.
2. Schedules shall be provided for each system or sub-system in the FMS. Each schedule shall include all commandable points residing within the system. Each point may have a unique schedule of operation relative to the system use schedule, allowing for sequential starting and control of equipment within the system. Scheduling and rescheduling of points shall be accomplished easily via the system schedule spreadsheets.
  3. Monthly calendars for a 12-month period shall be provided that allow for simplified scheduling of holidays and special days in advance. Holidays and special days shall be user-selected with the pointing device or keyboard, and shall automatically reschedule equipment operation as previously defined on the weekly schedules.
- F. Historical Trending and Data Collection
1. Trend and store point history data for all FMS points and values as selected by the user.
  2. The trend data shall be stored in a manner that allows custom queries and reports using industry-standard software tools.
  3. At a minimum, provide the capability to perform statistical functions on the historical database:
    - a. Average.
    - b. Arithmetic mean.
    - c. Maximum/minimum values.
    - d. Range - difference between minimum and maximum values.
    - e. Standard deviation.
    - f. Sum of all values.
    - g. Variance.

## 2.04 APPLICATION NODES

- A. General
1. The Application Nodes (AN) shall include all monitoring, control and information Nodes including field panels.
  2. AN shall be programmable and governed by the requirements of their applicable codes, approvals and regulations.
  3. The AN shall be designed, packaged, installed, programmed and commissioned in consideration of their specific service and prevailing operating conditions. They shall be proven standard product of their original manufacturer and not a custom product for this Project.
  4. A failure at an AN shall not cause failures or non-normal operation at any other system AN other than the possible loss of active real-time information from the failed AN.
  5. Ancillary AN equipment, including interfaces and power supplies, shall not be operated at more than 80% of their rated service capacity.
- B. HVAC Nodes
1. HVAC Nodes shall provide both standalone and networked direct digital control of HVAC systems.
  2. A dedicated HVAC Node shall be configured and provided for each primary HVAC system (air handler, chiller) and each terminal HVAC system (VAV Box, Unit Heater, Fan Coil Unit, Cabinet Heater, Fan Powered Box, CV Box)
  3. Each HVAC Node shall be able to retain program, control algorithms, and setpoint information for at

- least 72 hours in the event of a power failure, and shall return to normal operation upon restoration of power.
4. Each HVAC Node shall report its communication status to the FMS. The FMS shall provide a system advisory upon communication failure and restoration.
  5. For each primary HVAC system, provide means of indication of system performance and setpoints at, or adjacent to the HVAC Node.
  6. For each primary HVAC system, provide a means to adjust setpoints and start/stop equipment at, or adjacent to the HVAC Node.
  7. Provide a means to prevent unauthorized personnel from accessing setpoint adjustments and equipment control functions.
  8. The HVAC Nodes shall provide the ability to download and upload configuration data, both locally at the Node and via the FMS communications network.
  9. The HVAC Nodes shall be provided with a permanently-mounted local graphic terminal where required in the sequences of this specification. The local graphic terminal shall provide dynamic graphical representation of the associated system status, with the ability for the operator to enter commands with proper password protection.

## 2.05 FIELD DEVICES

### A. Input Devices

1. Current Switch
  - a. Materials: Encased copper
  - b. Rating: 600vAC
  - c. Mounting: Split Core
  - d. Range: 1.5amps to 50 amps
  - e. Action: Trip point adjustment
  - f. Output: SPST, N.O.
  - g. Special: Status LED
2. Temperature Sensor - Nickel
  - a. Materials: Thin Film Nickel, White Plastic Case with Grey Plastic Base
  - b. Setpoint: Setpoint 55 to 85 degrees F, Single or Dual Adjustment, Graduated Scale (Wall Mount Only)
  - c. Mounting: Wall, Duct, Averaging, Well, Outdoor Air, Bearing, Solar
  - d. Range: -50 to 25 0 degrees F, 0 to 130 degrees F, up to 550 degrees F
  - e. Accuracy: High Precision: +/-0.34F degrees at 70 degrees F, Standard: +/-3.0F degrees at 70 degrees F
  - f. Special: Johnson Controls TE-60xx, 61xx, 63xx, 67xx Series
3. Temperature Sensors
  - a. Materials: Nickel element in a copper tube.
  - b. Mounting: Duct/Pipe, Room
  - c. Range: -50 degrees F to 250 degrees F, 55 degrees F to 85 degrees F
  - d. Accuracy: 0.1%
  - e. Output: Resistive 1000ohms at 70 degrees F
  - f. Special: Duct Element Holder, Brass Well Assembly, Room Mounting Bracket and Cover
4. Thermostat - Line Voltage
  - a. Materials: Cold Rolled Steel, Beige Thermoplastic, Sensing Element-Liquid
  - b. Contact Rating:
    - 1) 6 Ampere Running/ 36 Amps. Locked Rotor at 120 VAC
    - 2) 3.5 Amps. Running/ 21 Amps Locked Rotor at 208 VAC
    - 3) 3.0 Amps. Running/ 8 Amps Locked Rotor at 240 VAC

- c. Fan and System Switch Rating:
    - 1) 12 Amps. Running/ 34.8 Amps. Locked Rotor at 120 VAC
    - 2) 6.9 Amps. Running/19.1 Amp. Locked Rotor at 208 VAC
    - 3) 6.0 Amps. Running/17.4 Amps Locked Rotor at 240 VAC
  - d. Mounting: Wall
  - e. Range: 40 to 90 degrees F
  - f. Accuracy: +-2 degrees F
  - g. Differential: Mechanical: Approx. 0.7F degrees
  - h. Special: Johnson Controls T2x and T46 Series
5. Humidity Sensors
- a. Materials: Polymer
  - b. Rating: class 2
  - c. Mounting: Duct or Wall
  - d. Range: 20% to 80%
  - e. Accuracy: +/-3%
  - f. Protection: 0-100% non-condensing
  - g. Output: 0-10vDC, 4-20mA
  - h. Special: Duct or Wall Mounting Kit
- B. Controlled Devices
- 1. Globe Valve, Bronze Control Valve with Brass Trim, Electrically Actuated, 1/2 through 2 in.
    - a. Materials:
      - 1) Body - Cast Bronze
      - 2) Plug – Brass
      - 3) Seat - Brass Against Molded Elastomeric Disc
      - 4) Stem - Stainless Steel
      - 5) Packing - Ethylene Propylene Rubber
    - b. Rating: ANSI Class 250, fluid temp: 35 to 284 degrees F
    - c. Output Flow Maximum: 0.73 through 46.2 Cv
    - d. Special: Shall be Johnson Controls VG7000 Series Bronze Control Valves

### **PART 3- PERFORMANCE/EXECUTION**

#### **3.01 INSTALLATION PRACTICES**

- A. FMS Wiring
- 1. All conduit, wiring, accessories and wiring connections required for the installation of the Facility Management System, as herein specified, shall be provided by the FMS Contractor unless specifically shown on the Electrical Drawings under Division 16 Electrical. All wiring shall comply with the requirements of applicable portions of Division 16 and all local and national electric codes, unless specified otherwise in this section.
  - 2. All FMS wiring materials and installation methods shall comply with FMS manufacturer recommendations.
  - 3. The sizing type and provision of cable, conduit, cable trays, and trunking shall be the design responsibility of the FMS Contractor. If complications arise, however, due to the incorrect selection of cable, cable trays, trunking and/or conduit by the FMS Contractor, the Contractor shall be responsible for all costs incurred in replacing the selected components.
  - 4. Class 2 Wiring
    - a. All Class 2 (24VAC or less) wiring shall be installed in conduit unless otherwise specified.

- b. Conduit is not required for Class 2 wiring in concealed accessible locations. Class 2 wiring not installed in conduit shall be supported every 5' from the building structure utilizing metal hangers designed for this application. Wiring shall be installed parallel to the building structural lines. All wiring shall be installed in accordance with local code requirements.
    5. Class 2 signal wiring and 24VAC power can be run in the same conduit. Power wiring 120VAC and greater cannot share the same conduit with Class 2 signal wiring.
    6. Perform circuit tests using qualified personnel only. Provide necessary instruments and equipment to demonstrate that:
      - a. All circuits are continuous and free from short circuits and grounds.
      - b. All circuits are free from unspecified grounds; that resistance to ground of all circuits is no less than 50 megaohms.
      - c. All circuits are free from induced voltages.
    7. Provide complete testing for all cables used under this Contract. Provide all equipment, tools, and personnel as necessary to conduct these tests.
    8. Provide for complete grounding of all signal and communications cables, panels and equipment so as to ensure system integrity of operation. Ground cabling and conduit at the panel terminations. Avoid grounding loops
- B. FMS Raceway
  1. All wiring shall be installed in conduit or raceway except as noted elsewhere in this specification. Minimum control wiring conduit size 1/2".
  2. Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Architect.
  3. All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the surface to which they are attached.
  4. Flexible Metal Conduit shall be used for vibration isolation and shall be limited to 3 feet in length when terminating to vibrating equipment. Flexible Metal Conduit may be used within partition walls. Flexible Metal Conduit shall be UL listed.
- C. Penetrations
  1. Provide firestopping for all penetrations used by dedicated FMS conduits and raceways. All other project firestopping to be by other trade.
  2. All openings in fire proofed or fire stopped components shall be closed by using approved fire resistive sealant.
  3. All wiring passing through penetrations, including walls, shall be in conduit or enclosed raceway.
  4. Penetrations of floor slabs shall be by core drilling. All penetrations shall be plumb, true, and square.
  5. No penetrations in structural elements shall be made before receipt of written approval from the architect.
- D. FMS Identification Standards
  1. Node Identification. All nodes shall be identified by a permanent label fastened to the outside of the enclosure. Labels shall be suitable for the node location.
  2. Cable shall be labeled at a minimum of every 18" with the FMS System manufacturer's name and the type of signal carried within the cable, i.e. Analog Input, Analog Output, Binary Input, Binary Output, 24 VAC.
  3. Each of the cable types specified in Item A shall be of a different color coding for easy identification and troubleshooting. Recommended color coding:
    - a. Analog Input Cable      Yellow
    - b. Analog Output Cable    Tan

- c. Binary Input Cable Orange
  - d. Binary Output Cable Violet
  - e. 24 VAC Cable Gray
  - f. General Purpose Cable Natural
  - g. Tier 1 Comm Cable Purple
  - h. Other Tier Comm Cable Blue
4. Raceway Identification. All the covers to junction and pull boxes of the FMS raceways shall be painted with the appropriate color.
5. Wire Identification. All low and line voltage FMS wiring shall be identified by a number, as referenced to the associated shop drawing and as-built drawing, at each end of the conductor or cable. Identification number shall be permanently secured to the conductor or cable and shall be typed.
- E. FMS Node Installation
- 1. The FMS panels and cabinets shall be located as indicated at an elevation of not less than 2 feet from the bottom edge of the panel to the finished floor. Each cabinet shall be anchored per the manufacturer's recommendations.
  - 2. The FMS contractor shall be responsible for coordinating panel locations with other trades and electrical and mechanical contractors.
- F. Input Devices
- 1. All Input devices shall be installed per the manufacturer recommendation
  - 2. Locate components of the FMS in accessible local control panels wherever possible.

### 3.02 COMMISSIONING

- A. Fully commissioning all aspects of the Facility Management System work.
- B. Acceptance Check Sheet
- 1. Prepare a check sheet that includes all points for all functions of the FMS
  - 2. Submit the check sheet to the Architect for approval one month prior to testing.
  - 3. Complete the check sheet for all items and functions of the FMS and initial each entry with time/date as record of having fully calibrated and tested the FMS. Submit to Architect.
  - 4. The Architect will use the check sheet as the basis for acceptance testing with the FMS Contractor.
- C. Provide all necessary specialist labor, materials and tools to demonstrate to the Architect that the FMS has been commissioned and is operating in compliance with the contract. Prepare a list of noted deficiencies signed by both the Architect and the FMS Contractor.
- D. Promptly rectify all listed deficiencies and submit to the Architect that this has been done.
- E. The Architect will retest the deficiencies in conjunction with the FMS Contractor.

### 3.03 TRAINING

- A. The FMS Contractor shall provide the following:
- 1. Written notice to the Owner one (1) week before system to be turned over to Owner
  - 2. Eight (8) hours on site support the day system is turned over
  - 3. Up to eight (8) hours support one (1) week after turnover, at the discretion of Fulton County
  - 4. Up to eight (8) hours support one (1) month after turnover, at the discretion of Fulton County
  - 5. Up to eight (8) hours three to six (3-6) months after turnover when seasons change, at the discretion

- of Fulton County
6. Up to eight (8) hours two (2) weeks before 1-year warranty expires, at the discretion of Fulton County

### 3.04 SEQUENCES

- A. DX Rooftop Air Handling Unit
  1. General:
    - a. Control electronically with dedicated stand-alone HVAC Node (HN).
    - b. The system shall operate on a timed-programmed basis as determined by the system operator (initially set to start at 7:30 AM and stop at 6:30 PM, Monday-Friday).
  2. System Off:
    - a. The supply and exhaust fans shall be off.
    - b. The outside air damper shall be closed.
    - c. The return air damper shall be open.
    - d. The DX cooling shall be off
    - e. The electric heating shall be off.
  3. System Start:
    - a. When the air-handling unit is indexed to operate, the supply fan shall start first. NOTE: The mixed air dampers and the supply fan speed drive shall be ramped to their respective operating values over a time period (adj., initially set to 5 minutes).
    - b. Upon proof of supply fan operation, dampers and DX cooling coil shall be indexed to their "System Run" conditions.
    - c. The air handler shall be commanded on during the unoccupied mode when any of the associated zones is outside unoccupied setpoint temperature.
  4. System On:
    - a. Unoccupied Heating Mode:
      - 1) Supply Fan: Supply fan shall cycle to maintain space temperature at the unoccupied heating setpoint (adj.). The supply fan shall be controlled to maintain duct static pressure at setpoint (adj., initially set to 2.5" w.c. pa).
      - 2) Economizer Dampers: Outside air damper is fully closed and return air damper is fully open.
      - 3) Electric heating: Heating shall be staged on when room temperature drops below night setpoint.
      - 4) DX Cooling Coil: Off.
    - b. Unoccupied Cooling Mode:
      - 1) Supply Fan: Supply fan shall cycle to maintain space temperature at the unoccupied heating setpoint (adj.). The supply fan shall be controlled to maintain duct static pressure at setpoint (adj., initially set to 2.5" w.c. pa).
      - 2) Economizer Dampers: Economizer dampers shall be enabled to provide free cooling when the outside air temperature is below the dry bulb economizer setpoint.
    - c. Economizer Available: Outside air and exhaust dampers are fully open and return air damper is fully closed when the supply fan are on.
    - d. Economizer Not Available: Outside air and exhaust dampers are fully closed and return air damper is fully open.
      - 1) DX Cooling Coil: Staged when fans are on to maintain unoccupied temperature setpoint.
      - 2) Electric heating shall be turned off.
    - e. Warm-up Mode:
      - 1) Supply Fan: Supply fan shall start and run continuously. The supply fan speed shall be controlled to maintain duct static pressure setpoint.

- 2) Economizer Dampers: Outside air damper is fully closed and return air damper is fully open.
- 3) Electric heating: Heating shall be staged on to bring supply air temperature to setpoint.
- 4) DX Cooling Coil: Off.
- f. Cool-down Mode:
  - 1) Supply Fan: Supply fan shall start and run continuously. The supply fan speed shall be controlled to maintain duct static pressure setpoint.
  - 2) Electric heating: Electric heating shall be turned off.
  - 3) Economizer Dampers: Economizer dampers shall be enabled to provide free cooling when the outside air temperature is below the dry bulb economizer setpoint.
    - a) Economizer Available: Economizer dampers shall modulate subject to a mixed air low limit of 40 degrees F (adj.).
    - b) Economizer Not Available: Outside air damper is fully closed and return air damper is fully open.
  - 4) DX Cooling Coil: Staged in sequence with the economizer dampers to maintain the discharge air temperature at setpoint as reset by space temperature.
- g. Occupied Mode:
  - 1) Supply Fan: Supply fan shall start and run continuously. The supply fan speed shall be controlled to maintain duct static pressure setpoint. Powered exhaust fan shall be modulated to maintain space static pressure setpoint (adj.).
  - 2) Economizer Dampers: Economizer dampers shall be enabled to provide free cooling when the outside air temperature is below the dry bulb economizer setpoint.
    - a) Economizer Available: Economizer dampers shall modulate subject to a mixed air low limit of 40 degrees F (adj.).
    - b) Economizer Not Available: The economizer dampers shall maintain a minimum outside air damper position (adj.).
    - c) CO<sub>2</sub> control (typical for one RTU): Economizer dampers shall modulate open to provide additional outside air subject to a space CO<sub>2</sub> sensor to maintain setpoint (adj.).
  - 3) Heating Mode: In the heating mode, the electric heating shall be controlled to the calculated discharge air setpoint as determined by the error between the actual zone temperature and the zone temperature setpoint of 72 degrees F (adjustable).
  - 4) DX Cooling Coil: Staged in sequence with the economizer dampers and electric heating to maintain discharge air temperature setpoint as reset by space temperature.
- h. Purge/Ventilation Mode: Software command at the OWS will initiate the following:
  - 1) Supply Fan: Supply fan shall start and run continuously. The supply fan speed shall be controlled to maintain duct static pressure setpoint. Powered exhaust fan shall be modulated to maintain space static pressure setpoint (adj.).
  - 2) Economizer Dampers: Economizer dampers shall be modulated to their 100% outdoor air position.
  - 3) Heating Mode: In the heating mode, the electric heating shall be controlled to the calculated discharge air setpoint as determined by the error between the actual zone temperature and the zone temperature setpoint of 72 degrees F (adjustable).
  - 4) DX Cooling Coil: Staged in sequence with the economizer dampers and electric heating to maintain discharge air temperature setpoint as reset by space temperature.
5. System Stop:
  - a. When the air-handling unit is indexed to shut down, the supply and exhaust fans shall stop.
  - b. Dampers and control valve shall be indexed to their "System Off" conditions.
  - c. Electric heating shall shut down.

6. Safeties and Alarms:
  - a. Smoke Control:
    - 1) Duct smoke detector(s) shall stop the supply and exhaust fans and annunciate alarm when products of combustion are detected in the air stream. Dampers and control valve shall be indexed to their "System Off" conditions.
    - 2) The supply and exhaust fans shall be interlocked to shut down upon a command from the building fire alarm system.
    - 3) Upon a return to normal, the supply and exhaust fans shall start after an adjustable delay to provide a staggered start of all building loads.
  - b. Filter Condition: Monitor differential pressure across filter and annunciate alarm when differential pressure setpoint (adj.) is exceeded.
  - c. Low limit: Manual reset low limit thermostat shall stop the supply and exhaust fans, close the outdoor air dampers, fully stage the electric heating on and annunciate alarm should the coil discharge air temperature fall below 38 degrees F.
  - d. High Limit: Manual reset high limit thermostat located in the return air shall stop the supply and exhaust fans and annunciate alarm should the return air temperature rise above 125 degrees F. Dampers and shall be indexed to their "System Off" conditions.
  - e. Fan Volume Control: The variable speed drive on the supply fan shall be modulated by a static pressure sensor located in the discharge plenum of the supply fan to provide a static pressure of 2.5" w.g. (adj.) at that point.
  - f. Static High Limit: The static high limit sensor located in the discharge of the supply fan shall shut down the unit and annunciate alarm if discharge static exceeds 3" w.g.(adj.).
7. Failure Modes:
  - a. Fan Failure: If the supply or exhaust fan fails to operate, both fans shall shut down and alarm shall be annunciated. Dampers and DX coil shall be indexed to their "System Off" conditions.
  - b. Sensor Failure: Upon the failure of an analog sensor, associated dampers and control valve shall remain at their last position and alarm shall be annunciated.
  - c. Power Failure:
    - 1) Fans: Upon restoration of power, the supply and return fans shall start after an adjustable delay to provide a staggered start of all building loads.
    - 2) Dampers: Economizer dampers shall be provided with spring return actuators to fail to their "System Off" positions
- B. Fan Powered Terminal Unit with Electric Reheat
  1. General:
    - a. Terminal unit control dedicated to individual zones using fan powered electric reheat to condition the zone.
  2. System Off:
    - a. The electric heat shall be stopped.
    - b. The damper shall move to the closed position.
    - c. The fan will go to the off position.
  3. System Start:
    - a. The fan powered terminal units shall be energized when the air handling unit serving the unit is energized, or when the DDC system indicates night low limit operation.
  4. System On:
    - a. The terminal unit fan shall run continuously when the unit is energized.
    - b. The primary air flow shall be controlled in response to room temperature. The primary air flow shall have maximum and minimum settings.

- c. The unit shall increase primary air flow upon a rise in room temperature above the setpoint.
  - d. As the room temperature falls below setpoint the primary air is modulated to its minimum position.
  - e. Upon a further fall in room temperature, the electric heat shall energize to maintain room setpoint.
  5. System Stop:
    - a. The electric heat shall be stopped.
    - b. The damper shall move to the closed position.
    - c. The fan shall move to the off mode.
  6. Safeties and Alarms:
    - a. An alarm shall be noted in the event of a low and/or high temperature limit in the zone sensor.
    - b. Refer also to Point List.
  7. Failure Mode:
    - a. The terminal unit heat shall fail to the off position.
    - b. The terminal unit damper shall fail to the open position
    - c. The fan shall fail to the off position.
- C. Steam Duct Humidifier
1. General:
    - a. Control electronically with dedicated stand-alone HVAC Node (HN).
    - b. Humidity monitored by duct humidity sensor and controlled by a staged or modulating control valve.
    - c. Strap on sensor shall open jacket valve to maintain jacket temperature if applicable.
    - d. Provide graphic display at workstation.
  2. System Off:
    - a. The steam valve shall remain closed.
  3. System Start:
    - a. Upon proof of airflow, system will be enabled to operate.
    - b. When the duct humidity falls below 50% relative humidity (adj.) control valve and jacket valve shall modulate or stage open.
  4. System Run:
    - a. Humidity valve shall modulate or stage to maintain adjustable humidity setpoint of 55% relative humidity.
  5. System Stop:
    - a. When duct humidity rises above an adjustable setpoint of 60% relative humidity control valve shall modulate closed.
  6. Safeties and Alarms:
    - a. Humidity valve shall be prevented from operating until positive proof of airflow.
    - b. Humidity High Limit: Sensor located downstream from humidifier shall close control valve upon exceeding high humidity limit. Safety can be reset either manually or automatically depending on type of sensor chosen.
    - c. Alarm may be sent to workstation upon high humidity shutdown.
    - d. Refer also to Point List.
  7. Failure Modes:
    - a. If humidification control valve fails to operate or receive signal, the control valve shall return to the closed position and alarm may be annunciated.
- D. Exhaust Fan Occupied/Unoccupied Control
1. General:
    - a. The exhaust fan shall run in different modes when in occupied or unoccupied control.

2. System Off:
    - a. The exhaust fan shall be in the off mode.
  3. System Start:
    - a. Upon a signal from the FMS system the fan shall start.
  4. System On:
    - a. Upon a call from the FMS the system fan shall start during occupied hours of the day.
  5. System Stop:
    - a. The fan shall stop during unoccupied hours set by the FMS.
  6. Safeties and Alarms:
    - a. The system shall have a manual override switch to turn the system on during unoccupied hours.
    - b. Refer also to Point List.
  7. Failure Modes:
    - a. The fan shall fail to the closed position.
- E. Exhaust Fan Temperature Control Direct Digital Control
1. General:
    - a. Exhaust fan control to maintain a thermostat setpoint throughout the space with direct digital control.
  2. System Off:
    - a. The fan shall move switch to the off position.
  3. System Start:
    - a. Upon a signal from the exhaust fan shall start to maintain a thermostat setpoint.
  4. System On:
    - a. The exhaust/supply fan shall be started and stopped through the automation system through the auxiliary contacts of the associated air handling unit.
  5. System Stop:
    - a. The fan shall move to the off position.
  6. Safeties and Alarms:
    - a. Wall switch: The exhaust/supply fans shall also be started and stopped from a standard wall switch. This switch will override the fan "on" or "off" from the space and bypass the automatic operation with the air handling unit.
    - b. FACP: The fire alarm control system shall be started and stopped from the fire alarm control panel.
    - c. Refer also to Point List.
  7. Failure Modes:
    - a. The fan shall fail to the off position.

3.05 POINTS LIST (see attached)





**SECTION 15 170 - HVAC INSULATION**

**PART 1 GENERAL**

1.01 GENERAL REQUIREMENTS

- A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 15010, Mechanical General.

1.02 WORK INCLUDED

- A. The work done under this section shall include all labor, materials, accessories, services and equipment necessary to furnish and install all insulation, complete, as indicated on the Drawings and as specified herein.

**PART 2 PRODUCTS**

2.01 MATERIALS

- A. Materials as specified in this section shall be manufactured by Armstrong, Owens-Corning, Johns-Manville, Knauf, Pittsburgh-Corning, Certainteed, Pabco, or approved equal.
- B. Insulation thicknesses shall be as shown in the following table.

Minimum Pipe Insulation		Insulation Thickness for Pipe Sizes				
Piping System Types	Fluid Temperature Range		Runouts 2 in. • in.	1 in.	1-1/4	2-1/2
	°C	F		Less in.	to in.	to in.
{Cooling Systems}						
Chilled Water,	4.5-13	40-55	1.0	1.0	1.5	1.5
	Below 4.5	Below 40	1.0	1.0	1.5	1.5

+Runouts to Individual Terminal Units (not exceeding 12 ft. in length)

- B. Chilled water and cooling coil condensate piping, valves and fittings shall be insulated with 5 lb. density, sectional fiberglass insulation with a thermal conductivity not to exceed 0.24. Jacket shall be fire retardant with a suitable vapor barrier. All joints and seams shall be sealed vapor tight. All joints and seams shall be lapped in place to form a continuous vapor barrier covering. All seams shall then be covered with "All Service Jacket" three inch wide tape. The tape shall match the jacket. The tape shall be squeegeed in place to provide complete adhesion of the tape to the jacket and to provide a continuous vapor barrier covering. Exterior cooling water piping shall be heat traced.
- C. Piping installed outdoors shall be insulated with cellular glass insulation, Pittsburgh-Corning "Foamglas" or approved equal. Where heat tracing is specified, oversize insulation to allow space for heat tape.
- D. Equipment shall be insulated in the same manner as specified for the associated piping. Suitable provisions shall be made for breaking flanges as may be required for maintenance. Hot water pumps do

not get insulated unless specifically called for.

- E. Provide high density preformed pipe insulation inserts at all pipe hangers. Inserts shall be equal to Foamglas by Pittsburgh Corning or calcium silicate.
- F. All exposed insulated piping in mechanical rooms below 10'-0" AFF shall be protected by a corrugated aluminum jacket with bands 3'-0" O.C.
- G. Ductwork
  - 1. All AHU-1 air supply ducts with heated or cooled air and within 10 feet of the building perimeter shall be insulated. All return ducts in concealed and unheated areas shall be insulated.
  - 2. AHU-1 Ducts in the building shall be insulated with 2" thick blanket, 3/4 pound density with reinforced foil faced vapor barrier. Insulation shall be securely adhered to ductwork. All joints shall be sealed with 3 inch wide strips of the vapor barrier materials and applied to form a continuous vapor seal.
  - 3. Ducts in the Mechanical Room and exposed ducts shall be insulated with 1 inch (1") three (3) pound density rigid fiberglass board with an R factor of not less than 5 ( $K = 0.235$  at 75 degrees mean temperature) with reinforced foil vapor barrier. Insulation shall be secured to ductwork with stick pins and speed washers. All joints shall be sealed with 3 inch wide strips of vapor barrier material and applied to form a continuous vapor seal.
- H. All fresh air ducts shall be insulated as specified above for air conditioning ductwork.
- I. All insulation must meet applicable codes for Flame Spread and Smoke developed rating.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Prior to beginning work, Subcontractor shall submit to the Engineer, for approval, a complete package of materials and methods intended for use as described in this section.
- B. All work shall be in strict accordance with applicable codes and ordinances and the manufacturer's recommendations.
- C. All work shall be performed in a workmanlike manner and standard trade practice. It shall be smooth in appearance and suitable for finish painting.
- D. All exterior piping shall be installed with a corrugated aluminum jacket with bands 3'-0" O.C.
- E. Fiberglass pipe insulation shall be applied to clean dry pipe and prior to leak testing. Chilled and condenser water systems shall not be operated until the insulation is completely installed with vapor barrier in place.

**END OF SECTION**

## SECTION 15190 - BALANCING & ADJUSTING

### PART 1 GENERAL

#### 1.01 WORK INCLUDED

- A. The work described by this section of the specifications consists of furnishing all materials, instruments, labor, and appurtenances to balance and adjust all of the air and water systems furnished and installed under Division 15 of the specifications.
- B. The balancing and adjusting firm or company shall specialize in air and water balancing, shall show a specific record of having balanced other systems of similar size and complexity and which has been in business for at least five years, and shall be certified by the Associated Air Balance Council (AABC). All test and balance work shall be performed according to AABC Standards.
- C. The HVAC Subcontractor shall be responsible to cooperate with and provide for the balancing Subcontractor any and all materials, services, labor, etc. to facilitate completion of the balancing work.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. All equipment and materials used for test and balance work shall be calibrated and checked for accuracy prior to use.

### PART 3 EXECUTION

#### 3.01 AIR SYSTEMS

- A. Systems shall be adjusted and balanced so that air quantities and temperatures at outlets are as shown on the contract drawings and so that the distribution from supply outlets is uniform over the face of each outlet.
- B. Adjustments shall be in such a manner that splitter and volume adjusters close to air outlets will have the least pressure drop consistent with volume requirements. Primary balancing shall be obtained by adjustment of the dampers at branch duct take-offs. Adjustable fan drives shall be used for making final adjustments of total air quantities. Additional dampers or other air volume adjusters required to accomplish the balancing and adjusting shall be furnished and installed as part of the HVAC work.
- C. Settings of dampers, splitters and other volume adjusting devices shall be permanently marked, after completion of balancing and adjusting, so that they can be restored if disturbed at any time. Also, the addition and setting of baffles shall be included where required to get a good mix by the HVAC Subcontractor at the direction of the balancing and adjusting Subcontractor.
- D. Direct reading velocity meters may be used for comparative adjustment of individual outlets, but air quantities in ducts having velocities of 1000 feet per minute or greater, shall be measured by means of pitot tubes and inclined gauge manometers. Instrument test opening enclosures shall be provided as required at the direction of the balancing and adjusting Subcontractor.

- E. Adjustment of the temperature controls shall be coordinated by the person in charge of the balancing and adjusting and shall be performed coincidental therewith. In conjunction with the Temperature Control Company's Engineer, simulate a complete cycle of operation for each system.
- F. After completion of the testing, balancing and adjusting of the air systems, six copies of a report showing the following information shall be submitted to the Engineer for review:
  - 1. Location of each air outlet or inlet.
  - 2. Dimensions or size of each outlet or inlet.
  - 3. Type and manufacturer: diffuser, grille, register, supply, return, exhaust.
  - 4. Cfm of air as indicated on drawings for each outlet or inlet with corresponding velocity.
  - 5. Velocity of air as measured and corresponding cfm at which system has been balanced and adjusted, for each outlet or inlet.
  - 6. Velocity of air measured and corresponding cfm, after each complete system has been balanced and adjusted, for each main branch or zone duct at the supply fan, the return fan and the exhaust fan, as the case may be.
  - 7. After each complete system has been balanced and adjusted, the total cfm at fan discharge, the total return air to the apparatus, the total outside air to the apparatus, the total outside air to the apparatus, static pressure at fan outlet, total static pressure for apparatus, fan speed, motor amperage for each phase and voltage.
  - 8. The above balancing and adjusting shall be performed for the first season of the year, cooling season or heating season, which occurs at the completion of the building. Additional balancing and adjusting which may be required for the season of the year next following shall be performed as part of the work under this specification.

### 3.02 WATER SYSTEMS

- A. Water circulating systems shall be adjusted and balanced so that water quantities circulated through the apparatus will be as specified.
- B. Where no meters are provided, the adjustment of individual coil circuits shall be based on return water temperatures and pressure drops, provided air balancing and adjusting has been satisfactorily completed first. Temperature control valves shall be wide open during the balancing. Balancing cocks and valves shall be set. If this results in excessive total flow, this shall be corrected by partial closing of pump discharge valves during further adjusting and balancing. Settings of cocks, valves, etc. shall be permanently marked so that they can be restored if disturbed at any time.
- C. After completion of the balancing and adjusting of the water systems, six copies of a report showing the following information shall be submitted to the Engineer for review:
  - 1. Identification of each piece of apparatus, manufacturer, size, model, rows, etc.
  - 2. Flow as indicated on drawing for each piece of apparatus and corresponding pressure drop.
  - 3. Temperatures, pressures and corresponding water flow at each coil after each complete system has been balanced and adjusted.
  - 4. Head, gpm, bhp, volts, amps for each pump specified.
  - 5. Suction and discharge pressures at each pump and corresponding water flow after each complete system has been balanced and adjusted.

**END OF SECTION**

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## SECTION 15 200 - WATER TREATMENT

### PART 1 - GENERAL

#### 1.01 GENERAL REQUIREMENTS

- A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 15010, Mechanical General.

### PART 2 - PRODUCTS

#### 2.01 GENERAL

- A. Furnish and install apparatus to provide water treatment and service as furnished by Betz Laboratories, Water Chemicals, Inc., or Barclay Chemical Co., Inc.
- B. A contract agreement satisfactory in form and substance to the Owner shall be executed between the Subcontractor and the water treatment company through its authorized agents, binding the Water Treatment Company to furnish supervisory service during the guarantee period to assure the use of the proper chemical treatment to and for the heating systems. The furnishing of the necessary chemicals for the treatment of hot water during the temporary heat period and supervision of their use shall be included in the contract agreement. The contract shall be assigned by the Subcontractor to the Owner on the date that the building is accepted by the Owner so that water treatment will continue uninterrupted during the one year life of the contract. The Water Treatment Company shall perform the following through its agents.
  - 1. Supervise the initial introduction of water treatment.
  - 2. Provide service calls by its agents at a frequency of not less than once per 30 days thereafter.
  - 3. Furnish all required chemicals for proper treatment of all systems together with all necessary testing equipment and reagents for field analysis of the water.
  - 4. Supervise flushout of all systems.
  - 5. The Subcontractor shall assume responsibility for the field testing and control, and regular addition of chemical treatment in whatever amounts are necessary on each of the systems until the date of acceptance of the building by the Owner.
- C. Control Ranges - All water treatment applied to any of the above mentioned systems must be non-pollutant and meet all State and Federal Government regulations covering effluent disposal.

#### 2.02 CHILLED WATER SYSTEMS

- A. Liquid chemical by-pass type one-shot feeder of five gallons capacity, complete with valves and fittings shall be connected across the hot and chilled water piping.
- B. Water systems shall be treated with sufficient quantities of proper chemical to prevent corrosion damage and scale buildup.

#### 2.03 FLUSHING OUT TREATMENT

- A. After completion of the installation of the above systems, each system shall be flushed out prior to the starting up of each of the systems with the compounds furnished by the Water Treatment Company. Flush out compound shall be trisodium phosphate, three percent by weight. Must be circulated 48 hours.

- B. The flushing out treatment shall be applied to all of the above systems under the supervision of the Water Treatment Company. Tests shall be made by the Water Treatment Company following the chemical flushing out treatment and a report shall be made in writing to the Engineer stating that the cleaning and flushing has been completed satisfactorily. Chemical concentrations allowable after flush-out: Phosphate, zero; Alkalinity, 100 parts per million maximum; Suspended solids, zero.
  
- C. It shall be the responsibility of this Subcontractor to coordinate between the pump manufacturer and the Water Treatment Company to arrive at a proper level of treatment to be maintained so as not to damage the pump and agreed upon by both above parties.

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

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## SECTION 15 210 - WATER SPECIALTIES

### PART 1 GENERAL

#### 1.01 GENERAL REQUIREMENTS

- A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 15010, General Requirements for Heating, Ventilating and Air Conditioning.

#### 1.02 WORK INCLUDED

- A. Receipt, unloading, handling, proper storage and protection from damage of all materials.
- B. Layout and coordination of work with other trades.
- C. The work under this Section shall include all labor materials, accessories, services, and equipment necessary to furnish and install all water specialties, as indicated on the Drawings and as specified herein.

### PART 2 PRODUCTS

#### 2.01 EXPANSION TANKS

- A. Furnish and install for each closed hydronic system expansion tanks which shall be of the horizontal type for ceiling mounting, and as shown on the Drawings.
- B. Each tank shall be built in accordance with the ASME Code for unfired Pressure Vessels and shall be completely air tight. Each tank shall be completely air tight. Each tank shall be complete with gauge glass and all other required tappings. Each tank shall be delivered to the job with factory prime coat. Each tank shall be suitable for 125 psi working pressure and 350 degrees F. maximum water operating temperature.
- C. Each tank shall be provided with 3" x 3" x 3/8" clip angles welded to each tank at the factory and shall have a minimum of one clip angle for each 200 pounds of weight when completely full of water. Each tank shall have not less than four of these clip angles and shall be hung as high as possible. Hangers shall be from the top cord of the bar joists.
- D. Each tank shall be fitted with sight glass. Extreme care shall be taken installing the sight glass to be sure that it is absolutely air tight. Provide sight glass valves to allow replacement of the sight glass during operation.
- E. Provide an approved air release fitting in the bottom of each tank on the point of connection to the system. The fitting shall incorporate, or install separately, an air tube set from the bottom of the tank to a point 8" from the top of the tank for the purposes of air level control.
- F. Each tank shall be fitted with a hose end bottom drain for complete drain down. Provide a gate valve in the tank header to system line.
- G. Insulate tank with 1" fiberglass insulation.

2.02 AIR SEPARATOR

- A. Furnish and install where shown on drawing a Rolairtrol air separator with strainer as manufactured by Armstrong or approved equal. Capacity as shown on drawings.
- B. Unit to be constructed according to the ASME Code stamped with "U" symbol and supplied with Form U-la certifying National Board compliance. Strainer to be of galvanized steel having 3/16" diameter perforations and a free area of not less than five times the cross sectional area of the connecting pipe.

2.03 PRESSURE REDUCING AND AUTOMATIC FILL VALVES

- A. Provide and install for each system as shown on drawings any automatic fill consisting of a Bell and Gossett 7, Dunham, Taco or approved equal all brass 3/4" pressure relief valve set at 30 pounds and a Bell and Gossett 12, Dunham, Taco or approved equal 3/4" iron body brass trim pressure reducing valve set at 20 pounds. Provide and install 3/4" bypass lines with 3/4" gate valves for quick fill.

**PART 3 EXECUTION**

3.01 INSTALLATION

- A. All water specialties as herein specified shall be installed and adjusted to suit the system needs and requirements. The installation shall be performed in strict accordance with the manufacturer's recommendations.

**END OF SECTION**

## SECTION 15 400 - PLUMBING SYSTEMS

### PART 1 GENERAL

#### 1.01 PLUMBING SYSTEMS DESIGN CRITERIA AND SCOPE OF WORK

##### A. SYSTEMS:

1. Systems to be provided under the Plumbing design section shall be as listed below. The connection point for all systems from the site utilities shall be at 5'-0" from the exterior of the building unless specifically otherwise noted.
  - a. Domestic cold, hot and hot water recirculation systems.
  - b. Sanitary, drainage, waste and vent systems.
  - c. Primary and emergency storm drainage systems.

##### B. DESIGN STANDARDS:

1. Plumbing systems shall be designed and installed in accordance with the requirements of the following codes, standards and design guides.
  - a. The Standard Plumbing Code, 2000 Edition with January 1, 2002 State of Georgia Amendments.
  - b. The Standard Building Code, 2000 Edition with State of Georgia Amendments.
  - c. The Standard Gas Code, 2000 Edition, with State of Georgia Amendments.
  - d. CABO Model Energy Code, 1995 Edition.
  - e. Americans with Disabilities Act (ADA).
  - f. American Society of Plumbing Engineers (ASPE) Data Books.
  - g. Sovent Cast Iron Design Manual No. 802, latest edition.
  - h. Plumbing Drainage Institute (PDI).
  - i. Underwriters Laboratories (U.L.).
  - j. National Sanitation Foundation (NSF).
  - k. Local and State Fire Marshal requirements.
  - l. Local Building and Inspection Department requirements.
  - m. Local Health Department requirements.

#### 1.02 GENERAL REQUIREMENTS

- A. Division 1, General Requirements and Supplementary Conditions, are hereby made a part of this section as fully as if repeated herein.
- B. The scope of work required by this section of the specifications consists of furnishing all materials, labor, supervision, equipment, appurtenances, accessories, connections, permits and services to perform all plumbing work, complete and placed into approved operating condition, including all tests and adjustments, in strict accordance with these specifications and the contract drawings.
- C. The principal work under this Section shall include, but not be limited to the following systems and equipment:
  1. Soil, waste and vent systems.
  2. Domestic hot and cold water systems.

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3. Storm water systems.
4. Plumbing fixtures.

5. Drains and drainage accessories.
  6. Insulation.
  7. Electric storage type water heaters.
- D. The drawings and these specifications are complimentary each to the other, and any labor, or material called for by either, whether or not by both, shall be furnished and installed. The contractor shall notify the Architect/Engineer of any discrepancies between the drawings and specifications regarding labor or materials prior to submitting bid.
- E. The drawings are diagrammatic in nature and indicate the various systems and piping required. All offsets, fittings, valves, devices and accessories which may be required are to be provided under this contract. The Plumbing Subcontractor shall examine the entire set of Contract Documents and carefully investigate the structural and finish conditions affecting all his work and shall arrange such work accordingly for the complete satisfactory operation of all systems, providing such fittings, traps, valves, devices and accessories as may be required to meet such conditions. Particular attention shall be taken to avoid foundations, footing and other structural elements furnished under other sections of the specifications. Any adaptations, modifications, or additions are the responsibility of and shall be borne by this subcontractor and shall be approved by the Engineer before execution. All openings, blockouts or sleeves required for the execution of this subcontract are the responsibility of this subcontractor to coordinate.

#### 1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Excavation and backfill for installation of the specified systems shall be done by this subcontractor.
- B. Core drilling, masonry work and painting incidental to the installation of the specified systems shall be included in the scope of work of this subcontractor.
- C. Electrical connections shall be done under other sections of these specifications.
- D. Restroom accessories shall be furnished under other sections of these specifications.
- E. Fire protection/sprinkler systems shall be done under other sections of these specifications.

#### 1.04 REFERENCES

- A. Codes, Ordinances and Permits
  1. All work performed under this Section of the Specifications shall conform to all codes, ordinances, and regulations of the City, County, State and/or other authorities having jurisdiction. All work shall conform to the 2000 Standard Plumbing Code with all local amendments as a minimum.
  2. This subcontractor shall give proper authorities all requisite notices, file all required plans relative to the work specified herein with proper authorities, secure and pay for all permits, licenses and certificates relating to his work.
  3. If code or other requirements exceed the provisions shown on the contract documents, the Engineer shall be notified in writing. Where requirements of the contract documents exceed code requirements, work shall be furnished and installed in accordance with the Contract Documents. Any work done contrary to these requirements shall be removed and replaced at the Contractor's expense.

#### 1.05 SUBMITTALS

- A. Shop Drawings and Catalog Data
1. Contractor shall prepare, submit, and obtain Engineer's review of manufacturers' submittals on the following equipment and systems prior to ordering, purchasing, or installation of any equipment or materials, and within 30 days from date of contract award. All required submittals shall be transmitted simultaneously in hard ring binders with the associated specification section and the item submitted clearly identified. Partial submittals will be returned without review unless previously agreed to by the Engineer.
    - a. Plumbing fixtures, faucets and trim.
    - b. Water heaters.
    - c. Insulation.
    - d. Floor drains and drainage accessories.
    - e. Hydrants and hose bibbs.
    - f. Mixing valves.
    - g. Hot water return pumps.
    - h. Backflow preventers.
  2. A letter signed by an Officer of the contractor's company shall be included in the submittal book that states the following items meet or exceed the requirements of the specifications:
    - a. Pipe and fittings.
    - b. Valves.
    - c. Pipe supports.
    - d. Piping accessories.
    - e. Pipe labels and valve tags.
  3. All shop drawing approvals required by any code or enforcement authority, insurance underwriter, etc. shall be obtained prior to being submitted to the Engineer.
  4. Review of shop drawings by the Engineer does not relieve the Contractor from the responsibility for complying with all requirements of the Contract Documents.  
Furthermore, it shall be the responsibility of the contractor to coordinate the requirements of all approved equipment with other trades and disciplines such as roof openings, wall openings, electrical characteristics, etc. Such coordination shall be clearly indicated on the shop drawings.
  5. Shop drawings shall clearly indicate selection of model numbers, sizes, dimensions, electrical characteristics, etc. of the proposed equipment. Any deviations from specified equipment shall be clearly indicated on the submittal.

#### 1.06 EQUIPMENT, MATERIAL BID BASIS

- A. Manufacturers' names, model numbers, etc. as specified on the drawings and herein are for the purpose of describing type, capacity, function and quality of equipment and materials required.
- B. Unless "approved equal" is specifically stated, bids shall be based on equipment named in specifications or on drawings as "base" products. Proposed alternate equipment and materials may be submitted along with the "base" products, provided deductive pricing is included with the alternate.
- C. Alternate "approved equal" items listed shall conform to specified base items and shall be substantially equal in quality, size, weight, construction and capacities. The alternate equipment and materials shall be submitted as full equivalent to the equipment and materials specified, with sufficient supportive documentation and technical literature to demonstrate quality, performance, and workmanship without doubt or question. The Engineer shall consider the use of the alternate equipment based on the supportive documentation and other information available to him, and shall approve or disapprove any alternates. The decision of the Engineer shall in all cases be final.

1.07 EXAMINATION OF PREMISES

- A. Prior to the ordering or purchasing of any plumbing equipment or materials or the layout or installation of any work, the contractor shall examine the premises and verify any and all of the existing conditions under which he will be required to operate, or that will in any manner affect the work under this contract.

1.08 EXISTING SERVICES

- A. If existing active services are encountered that require relocation, notify the Architect and relocate as directed. Do not prevent or disturb operation of active services that are to remain.

1.09 COORDINATION OF TRADES

- A. The Plumbing Subcontractor shall give full cooperation to other trades, and shall furnish all information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference or delay.
- B. Piping and other plumbing equipment shall not be installed without first coordinating the installation of same with other trades. This Subcontractor, at his own expense, shall relocate all uncoordinated piping and other plumbing equipment installed should they interfere with the proper installation and mounting of electrical, HVAC equipment, ceilings and other architectural or structural finishes.
- C. This Subcontractor shall coordinate the elevations of all piping and equipment above ceilings and in exposed areas with the work of all other disciplines prior to installation.
- D. In areas where more than one trade is required to use common openings in beams, joists, chases, shafts and sleeves for the passage of conduits, raceways, piping, ductwork and other materials, this Subcontractor must coordinate the positions of all piping and equipment to be furnished under this section so that all items including the materials and equipment of other trades may be accommodated within the space available.
- E. This Subcontractor shall confirm that work installed under this section does not interfere with the clearances required for finished columns, pilasters, partitions, walls or other architectural or structural elements as shown on the Contract documents.
- F. Plumbing work that is installed under this contract which interferes with the architectural design or building structure, shall be removed and relocated as required at no additional cost to the contract.

1.10 OBTAINING AND GIVING INFORMATION

- A. Obtain detailed information from all manufacturers as to the proper method of installing and connecting same. Obtain all required information necessary to facilitate and complete the plumbing installation.
- B. Coordinate the shape, size and position of all openings required for materials and equipment under this section and give full information to other trades sufficiently in advance to allow proper access requirements. Provide all sleeves and supports necessary to complete the work specified under this section.
- C. In case of failure on the part of this Subcontractor to give proper information as noted above, all necessary Cutting and Patching will be performed at this Subcontractor's expense.

- D. The information to be furnished by this Subcontractor shall include sleeve openings (sizes and locations) and all other pertinent information relative to the plumbing installation. This Subcontractor shall also furnish to other trades the dimensions and weights of all major pieces of mechanical equipment, and schedule with other trades the clearances that will be required throughout the building to allow for the passage of same through the building to their required installation locations.

#### 1.11 PIPING IDENTIFICATION

- A. A marker showing the service and an arrow indicating the direction of flow shall be applied on the following piping installed under this section of the Specifications:
  - 1. Domestic hot, cold and hot water recirculation water piping.
  - 2. Sanitary, waste and vent piping.
  - 3. Primary and emergency storm drainage piping.
- B. Piping identification shall be applied on all piping systems in areas of exposed construction and in areas with accessible or lay-in ceilings. The piping shall be labeled at each wall and floor penetration (both sides), and at connections to equipment. In addition, straight runs of piping shall be labelled at intervals not greater than 25 feet.
- C. The letter size and background color shall conform with the Identification of Pipe System ANSI A-13-1. The vinyl plastic markers shall be as manufactured by Seton Name-Plate Company, W. H. Brady Company, or Westline products.

#### 1.12 OPERATING INSTRUCTIONS

- A. This Subcontractor shall give detailed instructions for a period of not less than two days to the responsible personnel designated by the Owner in the operation and maintenance of all equipment furnished under this contract. A letter containing the name of the person or persons to whom the instructions were given and the dates of instruction period shall be submitted to the Engineer in the as-built submittal.
- B. Prior to final acceptance by the Owner, this Subcontractor shall submit a complete as-built submittal to the Engineer for review, three (3) sets of operating and instructional manuals, spare parts lists, drawings, wiring diagrams, trouble shooting data, manufacturer's bulletins, and other pertinent data on all equipment furnished under this contract. Each set shall be enclosed in a suitable hard cover binder.
- C. A complete set of reproducible as-built drawings shall be provided indicating the location of all concealed piping dimensionally located from a minimum of two column lines or major building structures. Drawings shall be a minimum of 1/8" scale.
- D. Provide name, address and telephone numbers of the manufacturer's representative and service company for each piece of equipment installed in the as-built submittal package.

#### 1.13 GUARANTEE

- A. Guarantee for all work furnished and/or installed under this section shall be as specified in Division 1 or a minimum of one year from final acceptance.

### **PART 2 PRODUCTS**

#### 2.01 PIPING SYSTEMS

- A. General
  - 1. The various piping systems are classified as follows, and materials of construction shall be as specified unless otherwise noted on drawings.
  
- B. Domestic Cold Water System, underground, 3 inches and larger, suitable for working pressure of 125 psig to 5'-0" outside building.
  - 1. Pipe
    - a. Ductile iron thickness Class 51 for 3 inch and 4 inch size thickness, Class 50 for 6 inches and larger, ANSI A21.51 with bituminous coating outside and cement mortar lining inside.
  - 2. Fittings: All valves, fittings, and changes in direction or elevation shall have joints restrained in accordance with NFPA-24.
    - a. Grey iron or ductile iron mechanical or push-on joint, Class 50 or 51, cement mortar lining with bituminous coated exterior, ANSI A21.10 and A21.11.
  - 3. Joints: All joints shall be mechanical or push-on per ANSI A21.11.
  - 4. Trenching Conditions  
Class B1 bedding with 4" minimum thickness of clean granular fill. Recesses shall be provided at all pipe barrels to insure no loads are transmitted at the joint connections.
  
- C. Domestic cold water and hot water systems above ground, 4 inches and smaller, suitable for a minimum working pressure of 200 psig at 200 Degree F.
  - 1. Pipe
    - a. Type "L" hard drawn copper tubing per ASTM B-88 and Federal Specification WWT-799.
  - 2. Fittings
    - a. Solder or brazed joint copper fittings per B16.18 or 16.22.
  - 3. Joints
    - a. Soldered with lead-free solder, J. W. Harris "Bridgit" or equal.
    - b. Brazed joints with lead-free brazing filler materials and compatible alloys.
  
- D. Sanitary, waste and vent systems, below ground to 5'-0" outside building.
  - 1. Pipe
    - a. Schedule 40 DWV PVC pipe, ASTM 1785.
  - 2. Fittings
    - a. Schedule 40 DWV PVC, socket type fittings, ASTM 2665.
  - 3. Joints
    - a. Solvent joints for PVC, ASTM D-2564.
  
- E. Sanitary waste and vent system above ground.
  - 1. Pipe
    - a. Service weight no-hub cast iron soil pipe per CISPI 301 and ASTM A888 to be used on any piping in a plenum space and on water closet and urinal drainage piping.
    - b. Polyvinyl Chloride (PVC), schedule 40 DWV PVC pipe, ASTM 1785 to be used in non-plenum spaces only.
  - 2. Fittings
    - a. Service weight no-hub cast iron fittings per CISPI 301 and ASTM A888.
    - b. Schedule 40 DWV PVC, socket type fittings, ASTM 2665.
    - c. Urinal connections shall be iron pipe size brass with brass screwed fittings.
  - 3. Joints
    - a. All joints in no-hub piping shall be per CISPI 310, with stainless steel clamps.
    - c. Solvent joints for PVC, ASTM D-2564.

2.02 VALVES, FLANGES AND UNIONS

- A. General
1. All systems under this section shall be provided with valves to permit complete and sectional control of the system. They shall be located to permit easy operation, replacement and repair. They shall be installed where shown on the drawings, or as herein specified. Valves shall be as manufactured by one of the following companies: Kennedy, Stockham, Powell, Milwaukee, Watts or approved equal, and shall conform to description listed below.
- B. Valve Description
1. Gate Valves
    - a. 2-1/2" and larger, Stockham G-634, 175 lb. flanged OS&Y.
    - b. 2" and smaller, Milwaukee Fig. 149, 125 lb., sweat connection. Option: Milwaukee "Butterball" BB2-350.
    - c. 2-1/2" and larger, Milwaukee Fig. F-2885, 125 lb., flanged or Milwaukee CW 223 Butterfly valve with 10 pos. lever handle. 8" and larger: Milwaukee CW 323 Butterfly valve with gear operator.
    - d. 2-1/2" and smaller, Milwaukee No. BB-SC100, screwed.
    - e. 2" and smaller, Milwaukee Fig. 1169, 150 lb., sweat connection.
  2. Check Valves
    - a. 2" and smaller, Milwaukee Fig. 509, 125 lb., screwed.
    - b. 2-1/2" and larger, Milwaukee Fig. F-2974, 125 lb. flanged.
    - c. 2-1/2" and larger, Stockham G-939, 175 lb. flange.
  3. Ball Valves
    - a. 2" and smaller, Milwaukee BA 100.
  4. Balancing Valves (Hot Water Recirculation)
    - a. Balancing valves shall be bronze body with brass ball, 200 psi working pressure. Valves shall be adjustable to positive shutoff with memory stop device. Valves shall have secured calibrated nameplates to indicate setpoint and differential pressure read-out ports with check valves across the valve seat area.
    - b. Balancing valves shall be Bell and Gossett Circuit Setter "RF" series or Gerand Balvalve Indicator.
  5. Backflow Preventers
    - a. Backflow preventers shall be installed on the water service piping, at all other locations required by code and local authorities, at all connections to mechanical equipment, and else where as shown on the drawings. Backflow preventers shall be reduced pressure principle type and shall be a complete assembly including tight-closing shutoff valves before and after the device. The design shall include test cocks and a pressure-differential relief seating check valves. The device shall meet the requirements of and be certified by ASSE Standard 1013, AWWA Standard C-506, and USC Foundation for Cross-Connection Control. A strainer shall be located upstream of the device. Route relief outlet from cone receptor to an air gap fitting for discharge to sanitary sewer.
  6. Pressure Reducing Valves
    - a. A duplex pressure reducing valve station shall be provided on all domestic water services greater than 60 psi.
    - b. A valved full sized bypass shall be installed around the pressure reducing valve station.
  7. Flanges
    - a. All flanges shall be faced and drilled for not less than 125 pounds steam working pressure complete with necessary adaptor, and shall be of size and material of adjacent piping. All flanges shall be faced (raised or flat) to be compatible with connecting valves, equipment, etc. The connection of one raised face flange to a flat face flange shall not be permitted.
  8. Unions and Joints
    - a. Unions on drainage pipes on fixture side of traps may be slip or flanged joints with soft rubber

washers or gaskets. Unions 2" and smaller on copper pipe shall be all brass with ground joint and shall be 250# copper to copper. Unions above 2" shall be flanged with gaskets. Provide union at water and gas connection to all equipment, except plumbing fixtures.

### 2.03 CLEANOUTS

- A. Cleanouts shall be provided where indicated on drawings and else where as required by code.
  - 1. Cleanouts in pipe lines shall consist of cast iron ferrule and heavy duty cleanout plug with square head as scheduled on the drawings. Where piping is concealed in floors or walls cleanouts shall be installed in or near surface of floor or walls and have countersunk plugs with covers.
- B. Cleanouts shall be provided at the base of the stack on all sanitary, waste and drainage stacks.
- C. Where such conditions occur in walls or partitions the cleanout cover shall be accessible through an opening left in the wall and covered with a flush chromium plated brass or stainless steel plate securely fastened in place.
- D. Where test tees are installed at the base of the stack, or on the stack, they may be used as a cleanout.
- E. Brass cleanouts shall be solid nut construction.
- F. Provide Owner with three (3) wrenches for removing flush cleanout plugs.

### 2.04 FLOOR DRAINS

- A. Setting Grades
  - 1. Before setting any drains, the Plumbing Subcontractor shall obtain the exact information relative to finished grade of the top of the drains.
- B. Drain Types
  - 1. All floor drain outlets shall be of size noted on drawings. All drains shall be equal to the figure number scheduled as indicated on the plans. Drains shall be acid-resisting where indicated.

### 2.05 ACCESS PANELS

- A. Group valves together above suspended ceilings, walls, furred spaces to minimize the number of access panels, but with all valves freely accessible for maintenance. Locate all valves within 1'-0" of access point.
- B. Furnish access panels of proper size to service concealed valves and cleanouts. Panels shall be of the proper type for material in which they occur and are to be furnished by this Subcontractor, but installed by the particular trade for the material within which the access panel is installed.
- C. Panels shall have flush doors with No.14 USCG steel door and trim No. 16 USCG steel frame, metal wings for keying into construction, concealed hinges, and screwdriver operated stainless steel cam lock. Panels shall be shop coated with one coat of zinc chromate primer. Valves above removable ceilings shall have tile clips by this Subcontractor for identification.
- D. Access panels are not allowed in gypsum ceilings in public spaces.

2.06 INSULATION

- A. The following shall be insulated:
  - 1. All domestic cold water piping above grade.
  - 2. All hot water and hot water return piping.
  
- B. Domestic hot, cold and hot water recirculation piping shall be insulated with 4 lb. density sectional fiberglass insulation with a thermal conductivity not to exceed 0.24 with white all service jacket and vapor barrier. All joints and seams shall be sealed vapor tight. All seams and staples shall then be covered with "All Service Jacket" three inch wide tape.
  
- C. Materials as specified in this section shall be manufactured by Armstrong, Owens-Corning, Schuller, or equal. Insulation thicknesses shall be as shown in the following table.

Minimum Pipe Insulation			Insulation Thickness for Pipe Sizes				
Piping System Types	Fluid Temperature Range		1 in. and Less	1-1/4 to 2 in.	2-1/2 to 4 in.	5 to 6 in.	8 in. and Larger
	°C	F	in.	in.	in.	in.	in.
PLUMBING							
Domestic Water	Ambient	Ambient	0.5	1.0	1.0	1.0	--
Domestic Hot Water and Hot Water Recirculation	43-71	110-160	1.0	1.0	1.5	1.5	--
Above Grade Drains and Piping Receiving Condensate or ice machine discharge	4.5-15.5	40-60	0.5	1.0	1.0	1.5	--

2.07 HEAT CABLE FOR FREEZE PROTECTION OF PIPING

- A. Provide electric heat tracing on all domestic water piping and sanitary traps exposed to exterior conditions.
  
- B. Electric heat cable shall be installed linearly along the bottom of the pipe and allowance shall be made for all fittings, valves, pipe supports, etc. Cable shall be installed prior to insulation of the piping system.
  
- C. Electric cable shall be capable of maintaining a minimum water temperature of 40 degrees F. at an ambient air temperature of 0 degrees F.
  
- D. The electric cable shall be the self-regulating type which responds to varying localized temperature conditions by varying the heat output along its length. This shall be accomplished by a self-regulating core which varies its resistance continuously with changes in temperature. A constant wattage heater is unacceptable.
  
- E. Provide a thermostat control which deenergizes the heating cable when the ambient air temperature is above 40 degrees F. (adjustable). While energized, the heat cable shall be entirely self-regulating.
  
- F. Provide all power connection hardware, splices, end seals, etc to accomplish installation. All hardware shall be by the same manufacturer as the cable.

- G. Electric heating cable and accessories shall be U.L. listed. Electric heating cable shall conform to all requirements of Division 16.
- H. Electric heating cable shall be Raychem XL or approved equal.

## 2.08 PIPE SUPPORTS & HANGERS

- A. All piping shall be supported by means of hanger rods and pipe hangers from roof or floor construction using supplementary steel and/or lagbolts.
  - 1. Piping shall be supported from new concrete construction with Grinnell Fig. 282 inserts.
  - 2. Piping shall be supported from new steel construction with Grinnell Fig. 131 beam clamp, Fig. 61 beam clamp, Fig. 66 welded beam attachment or Fig. 60 washer plate with all-thread rod.
  - 3. Piping and brackets shall be supported from hollow block construction using masonry drilled holes and toggle bolts.
  - 4. Piping shall be supported from wood truss construction with plated lag screws or bolts, B-3227 and B-3228.
- B. Unless otherwise noted, hangers and clamps shall be as listed below (all model numbers are B-Line Systems):
  - 1. Cast iron/steel pipe - B3100 or B3109.
  - 2. Insulated water pipe - B3100 or B3109 with B3151 insulation protection saddle.
  - 3. Uninsulated bare copper pipe - B3170 CTC plastic coated.
  - 4. All supports and mounting hardware are to be galvanized or cadmium plated.
- C. Branch piping to fixtures in chases shall be supported with plastic or copper clamp type supports:
  - 1. B-Line Ruffin series.
  - 2. Holdrite Systems.
- D. Minimum spacing between pipe hangers shall be:
  - 1. Steel pipe - ten feet (10'-0")
  - 2. All cast iron soil pipe and copper pipe less than 1-1/2" - five feet (5'-0").
  - 3. Copper pipe size 1-1/2" and larger - ten feet (10'-0").
- E. At least one hanger shall occur within 2'-0" from where change in direction takes place. Where pipes extend down or up to other floors, pipe clamps shall be provided on each floor to support vertical risers.
- F. Special approved hangers which require less installation space are to be used where required due to ceiling space limitations.
- G. All pipe supports shall be designed and installed to comply with requirements for seismic design category C.

## 2.09 WATER HEATERS - ELECTRIC

- A. Provide electric storage type water heaters as specified on the drawings.
- B. Water heater shall carry a U.L. certification for 150 psi working pressure, an ASME temperature and pressure relief valve (T and P) sized for the heater, vacuum relief valve, immersion thermostat, glass lined tank, temperature gauge on outlet, and manual reset high limit control.
- C. Provide a 4" high concrete housekeeping pad (and metal drain pan) at each water heater.

- D. Provide an expansion tank on the domestic water supply sized per the water heater manufacturers requirements.
- E. The water heater shall carry a five year minimum limited warranty for tank leakage.
- F. Electric water heaters shall be as manufactured by:
  - 1. A.O. Smith
  - 2. Bradford White
  - 3. State

#### 2.10 FLASHING

- A. Vent pipes passing through roof shall be flashed watertight.
- B. The roof connections shall meet the approval of the manufacturer of the roofing materials and shall comply with the roof bond requirements.
- C. All vent piping shall be offset above ceilings or in attic space and as shown on the drawings to penetrate roofs on the least visible sides of building.

#### 2.11 FLOOR, WALL & CEILING PLATES

- A. Furnish and install heavy gauge chromium plated steel wall and ceiling plates on all exposed pipes in finished areas where they pass through walls, ceilings, etc. Plates shall be of type that will remain permanently in position and where pipes are insulated they shall be of size necessary to cover insulated pipe.

#### 2.12 GALVANIC PROTECTION

- A. Insulate joints between dissimilar metals with suitable isolation gasket and bolts with fiber ferrules and washers and/or suitable armored insulation fittings by Clearflow, Crane, Capital, or Epc., so there will be no contact between the metals or with insulating bushings.

### **PART 3 EXECUTION**

#### 3.01 PIPING SYSTEMS

- A. Water Piping - General
  - 1. Pipe used in piping assembly must be clean of dirt and obstructions and shall have ends square and reamed before putting into the fittings.
  - 2. All piping must be true and plumb with proper pitch for draining of the soldering.
  - 3. All domestic water lines serving flush valve fixtures and washing machines shall be protected from water hammer by shock absorbers. Where shock absorbers are required they shall be as manufactured by Josam Mfg. Company, J. R. Smith, Precision Plumbing or Zurn Mfg. Co. and shall conform to the Plumbing and Drainage Institute published requirements.
  - 4. All connections to water heaters, tanks and equipment shall be made with unions or flanges. Insulated piping systems shall be installed to provide space for insulation.
- B. Sanitary Waste, Vent and Indirect Waste Piping - General:
  - 1. Pipes shall be plumb and parallel to building walls, beams and columns unless otherwise indicated.

All horizontal lines are to be evenly pitched and properly secured with iron or steel hangers, unless noted otherwise. A pitch of 1/4 inch per lineal foot shall be maintained on all soil, and waste lines, wherever possible. Where long runs of piping require less pitch due to space restrictions, a less pitch shall be allowed on main lines four (4) inches and over in size, but in no event should any pipe line have a slope less than 1/8 inch per foot.

2. All soil and waste pipes shall be extended out full size through the roof or connected to a common vent as shown on the drawings.
3. The main ventilation stacks shall run parallel to the soil pipe stacks and shall connect to the vent continuation of the soil stack at least three (3) feet above the rim of the highest plumbing fixtures on the stack. Vent stacks shall also be connected at the base or horizontal offset of the soil stack through a Y and 1/8 bend or an upright Y fittings. Offsets in vent pipe shall be made with 45 degree fittings wherever possible. Horizontal vent lines shall pitch toward a waste line.
4. Threaded joints shall have American National taper screw thread with graphite and oil compound applied to the male threads.
5. Piping is to be run straight and plumb and all offsets shall be made at an angle of not less than 45 degrees.

### 3.02 TESTING OF PIPING SYSTEMS

#### A. General

1. All piping systems shall be subjected, before being insulated or concealed, to testing with water or air as noted and shall hold tight at the pressure head stated for the time interval required without adding air or water. While any system is being tested required head or pressure shall be maintained until all joints are inspected.
2. All tests shall be witnessed by the inspector having jurisdiction and the Owner's Representative, with 48-hours minimum notice given these authorities.
3. All equipment, material, labor and testing mediums required for testing any of the various systems or any part thereof shall be furnished by this subcontractor.
4. All connected equipment, accessories, etc. shall be isolated from piping systems prior to testing.

#### B. Sanitary Piping Systems

1. Water test shall be applied to these drainage systems either in their entirety or in sections as required, after rough piping has been installed. If the system is tested in sections, each opening shall be tightly closed except the highest opening in the section under test. All sections shall be tested with a minimum of 10 foot head of water. In testing successive sections at least the upper 10 feet of the next preceding section shall be tested so that no joint of piping in the building except the uppermost 10 feet of the system shall be submitted to a test of less than a 10 foot of head water. The water shall be kept in the system for at least 30 minutes before inspection starts; the system shall then be made tight at all points.
2. Any points of the drainage systems to be tested with air instead of water shall be made by attaching an air compressor testing apparatus to any suitable opening and after closing all other inlets or outlets, forcing air into the system until there is a minimum gauge pressure of 5 psi. This pressure shall be held without the introduction of additional air for a period of at least 30 minutes.
3. Exterior connections shall be tested as part of the interior systems.

#### C. Interior Water Piping Systems

1. Upon completion of the entire water supply system or a section of it as required, it shall be tested prior to connection of fixtures and proved tight under a water/air pressure of 150 psi. Pressure shall hold for a period of one hour without introducing additional water/air. Water used for testing shall be from a potable source of supply. Defective joints or piping shall be replaced as required and all piping shall be retested.

- D. Exterior Water Piping System
  - 1. All exterior domestic water piping shall be tested to 150 psi for a period of two hours.
- E. Defective Work
  - 1. If inspection or tests show defects, such defective work or material shall be replaced and inspection and tests shall be repeated. All repairs to piping shall be made with new material. Caulking of screwed joints or holes is not acceptable.
- F. Additional Tests
  - 1. Provide all additional tests such as smoke or pressure tests as required by the regulations or as directed by authorities making the inspection.
  - 2. Provide for any repeated test as directed by the Owner's Representative, to make all systems tight as required.
  - 3. Visual inspections of joints, valves, etc. shall be made as directed by the Engineer.

### 3.03 DISINFECTION OF WATER SYSTEM - INTERIOR AND EXTERIOR

- A. Prior to project completion, all potable water piping systems shall be disinfected per local code requirements.
- B. Whenever the authority having jurisdiction does not specify disinfection procedures, the new water piping system shall be thoroughly disinfected with a solution containing not less than 50 parts per million of available chlorine. The chlorinating material shall be either liquid chlorine or sodium hydrochloride solution, shall be introduced into the system and drawn to all points in the system. The disinfection solution shall be allowed to remain in the system for a period of eight hours, during which period all valves and faucets shall be opened and closed several times. After disinfection, the solution shall be flushed from the system with clear water until the residual chlorine content is not greater than 0.2 parts per million.
- C. This work is to be supervised or performed by an approved chemical testing laboratory and results sent to Engineer or his representative for verification.

### 3.04 EXCAVATION & BACKFILL

- A. Contractor shall do all necessary excavations for all piping, equipment and apparatus under this section and shall backfill trenches by filling and tamping in not more than 6" layers after pipes have been installed, tested and approved. Care shall be taken not to excavate below depth necessary. If excessive excavation is made or pipes are installed in filled areas, fill soil shall be tamped to compaction as specified under the Division 2 specifications. Provide a layer of sand at least 6" deep under all plastic pipe installed in soil. Bell holes shall be excavated to insure that the sewer pipe rests for its entire length upon a solid trench bottom.

### 3.05 FIXTURE CONNECTIONS AND SUPPORTS

- A. Wall fixtures shall be hung by means of wall hangers supported by at least four (4) 3/8" lag bolts and expansion shields.

### 3.06 SLEEVES

- A. Furnish and install pipe sleeves around all piping passing through masonry walls, floors, beams, etc. Sleeves shall be of such diameter as to allow pipe to pass through easily and permit expansion and contraction of pipe. Where pipes are insulated, the sleeves shall be of such diameter as to allow the

insulated pipe to pass through easily. The sleeves shall be placed before the pouring of concrete and before construction of walls. Sleeves for vertical risers shall extend a minimum of 1" above the floor slab. Sleeves to outside walls below grade shall be caulked or provided with expansion type mechanical seals as required to make them waterproof.

**3.07 INSTALLATION OF UNIONS**

- A. Unions shall be located as shown on plans and as required by equipment so piping and equipment can be easily dismantled. Unions shall not be installed in any location where they are not readily accessible.

**3.08 TRAPS**

- A. All fixtures, drains, etc. shall be provided with traps, unless specifically shown or specified otherwise. Traps shall be set in an upright position, level and true, and shall be vented as shown and required. All exposed traps shall be provided with cleanout plugs.

**3.09 CLEANOUT INSTALLATION**

- A. Furnish and install cleanouts in soil and waste lines as required by Code and/or job conditions, as shown on the drawings and as follows: At or near the end of each branch and main drainage line, horizontal lines at intervals as required by code. All cleanouts shall be readily accessible, with plugs easily removable for cleanout lines. Cleanouts at the base of vertical piping shall be held within 2'-0" from finished floor unless otherwise indicated.

**3.10 FLASHING INSTALLATION**

- A. All pipes passing through roofs shall be flashed in an approved manner. Flashing shall be watertight.
- B. Roof connections shall meet the approval of the manufacturer of roofing material and shall comply with roof bond requirements.

**3.11 EQUIPMENT AND MATERIAL PROTECTION**

- A. During construction all equipment shall be properly protected against damage, defacing and freezing with shipping cartons, plastic sheeting, shipping covers.
- B. All open ends of piping and equipment shall be sealed with nipples and caps, plugs, test plugs until connection to system is made.

**3.12 SPACE REQUIREMENTS**

- A. Piping, apparatus and equipment shall fit into the space provided in the building or within the property and shall be installed at such time and in such manner as to avoid damage to the building structure or property as required by the job progress. Equipment, apparatus and accessories requiring normal servicing or maintenance shall be made easily accessible.

**END OF SECTION**

## SECTION 15 500 - FIRE PROTECTION SYSTEMS

### PART 1 GENERAL

#### 1.01 GENERAL REQUIREMENTS

- A. General Conditions: Refer to the General Conditions, the Supplementary General Conditions and the Special Conditions, all provisions of which apply to work under this section as if written in full herein.
- B. The scope of work described in these Specifications and/or indicated on the drawings shall include the furnishing of all materials, equipment, appurtenances, accessories, connections, labor, etc. required to completely install, clean, inspect, adjust, and leave in safe and proper operating condition all fire protection system components.
- C. SYSTEMS:
  - 1. Systems to be provided under the Fire Protection design section shall be as listed below. The connection point to the site utility service for the fire protection system shall be at 5'-0" from the exterior of the building unless specifically otherwise noted.
    - a. Automatic Sprinkler Systems.
    - b. Combination Standpipe/Automatic Sprinkler Risers.
    - c. Fire Department Valve Cabinets
    - d. Painting of exposed piping.

#### 1.02 QUALIFICATION OF CONTRACTORS

- A. The Contractor for the Fire Protection installation shall be a certified Fire Protection Contractor, licensed for the installation of automatic fire sprinkler systems and other fire protection equipment.

#### 1.03 DESIGN STANDARDS

- A. Fire Protection systems shall be designed and installed in accordance with the requirements of the following codes, standards and design guides.
  - 1. The Standard Fire Prevention Code, 2000 Edition with State of Georgia Amendments.
  - 2. The Standard Building Code, 2000 Edition, with State of Georgia Amendments.
  - 3. National Fire Protection Association (NFPA) Standards:
    - a. NFPA 13 - Installation of Sprinkler Systems, 1999.
    - b. NFPA 14 - Installation of Standpipe and Hose Systems, 2000.
    - c. NFPA 20 - Installation of Centrifugal Fire Pumps, 1999.
    - d. NFPA 24 - Installation of Private Fire Service Mains, 1995
  - 4. Factory Mutual (F.M.) Approval Guide
  - 5. Underwriters Laboratories (U.L.)
  - 6. Owners Insurance Underwriter Requirements
- B. DESIGN CRITERIA:
  - 1. Upon award of the contract, a new flow test from the two (2) hydrants nearest the site service entry is to be performed by the Fire Protection contractor to confirm the flow and pressure characteristics of the existing water service. The completed flow test data along with a utility service map of the area is to be forwarded to the Engineer for confirmation of the existing water service.

2. The entire facility will be protected by an automatic sprinkler system supplied by combination fire standpipe/automatic sprinkler systems located within the building stairwells.
3. Automatic sprinkler systems shall be designed to the available domestic water pressure available and shall be hydraulically calculated for the following design standards:

AREA/USAGE	HAZARD CLASSIFICATION	DENSITY GPM/Sq. FT.	REMOTE AREA	MAX. HEAD SPACING	INTERIOR HOSE STREAM
Public spaces, Lobbies, Corridors Offices, Restaurants, Lounges	Light	.10	1500Sq Ft.	225 Sq. Ft.	100 GPM
Mechanical Rooms, Electrical Rooms, Elevator Equip. Rooms, Maint./ Storage Rooms, Kitchen/Food Service Areas and Laundry Kitchen/Food Service Areas and Laundry	Ordinary Group 1	.15	1500Sq Ft.	130 Sq. Ft.	250 GPM

4. The fire protection systems shall not be designed to operate if the residual pressure of the existing water service falls to 20 psi or lower at design flow requirements.
5. The fire protection system design shall include a minimum of 10 psi safety factor to allow for future losses in the water service pressure characteristics.
6. The maximum allowable system velocities shall not exceed 20 fps unless alternate criteria is required by the Owner's Insurance Underwriter.

C. COMBINATION STANDPIPE/AUTOMATIC SPRINKLER SYSTEMS:

1. A Class III standpipe system with fire department valves shall be installed on both sides of the stage. The standpipes and hose reels are to be contained in a fire valve cabinets per the requirements of the Standard Building Code.
2. Standpipes will be designed to provide a minimum of 500 GPM. Fire mains supplying standpipes will be designed and sized to provide a minimum of 500 GPM at the most remote standpipe and 250 GPM for each additional standpipe per the requirements of NFPA 14.

D. FIRE PROTECTION SYSTEM ALARMS:

1. All valves in the fire protection system shall be provided with tamper switches wired for annunciation at the main FACP.
2. Automatic sprinkler system connections shall be provided with flow switches adjacent to the zone control valve wired for annunciation at the main FACP.
3. Upright automatic sprinklers will be provided in all elevator shafts, elevator machine rooms and electrical rooms. The service to each of these spaces shall be provided with a control valve with tamper switch and a flow switch located in an adjacent room and wired for annunciation at the main Fire Alarm Control Panel (FACP).

1.04 ORDINANCES, PERMITS AND DRAWING APPROVALS

- A. The Contractor shall, file all requisite plans relating to this section of the specifications with the proper authorities, secure all permits and approvals and pay all resultant fees for work done under this Section.
- B. All fire protection work shall comply with all laws, ordinances, rules, regulations and standards of the City, County, State and the Owner's Insurance Underwriter; all applicable sections of the National Fire Codes and the Codes and Standards of the National Fire Protection Association.
- C. If code or other requirements exceed the provisions shown on the contract documents, the Engineer shall be notified in writing. Where requirements of the contract documents exceed code requirements, work shall be furnished and installed in accordance with the contract documents. Any work done contrary to these requirements shall be removed and replaced at the Contractor's expense.

1.05 EQUIPMENT, MATERIALS, BID BASIS

- A. Manufacturers' names, model numbers, etc. as specified on the drawings and herein are for the purpose of describing type, capacity, function and quality of equipment and materials required.
- B. Unless "approved equal" is specifically stated, bids shall be based on equipment named in specifications or on drawings as "base" products.
- C. "Equal product" and "approved equal" items listed shall conform to specified base items and shall be substantially equal in size, weight, construction quality and capacities. The alternate equipment and materials shall be submitted as full equivalent to the equipment and materials specified, with sufficient supportive documentation and technical literature to demonstrate quality, performance, and workmanship without doubt or question. The Engineer shall consider the use of the alternate equipment based on the supportive documentation available to him, and shall approve or disapprove any proposed alternates. The decision of the Engineer shall in all cases be final.
- D. The contractor shall coordinate the installation of all fire protection equipment proposed for use in this project with all building trades (architectural, structural and electrical). Coordination shall be accomplished prior to, and shall be reflected in, the submittal of shop drawings for approval. Any modifications or revisions required by other trades as a result of the use of equipment other than the basis of design shall be made at no additional cost.

1.06 EXAMINATION OF EXISTING PREMISES

- A. Prior to the ordering or purchasing of any equipment or materials or the layout or installation of any work, the Contractor shall examine the premises and verify any and all of the existing conditions under which he will be obliged to operate, or that will in any manner affect the work under this contract. No allowance will be made subsequently in this connection in behalf of the Contractor.

1.07 PAINTING

- A. All piping exposed to public sight, such as standpipe and drain piping in stairwells, shall be primed and painted with two coats of an enamel based paint. The color shall be as directed by the Architect.
- B. Contractor shall touch-up to match original finish any equipment scratched in shipment or installation.

1.08 TRANSPORTATION, DELIVERY, STORAGE AND PROTECTION

- A. The Contractor shall provide and pay for all transportation, delivery, and storage required for all equipment and materials. Upon receipt of all equipment and materials, they shall be properly stored to protect them from vandalism, theft, the elements, and other harm or damage. Any equipment or materials received in a damaged condition, or damaged after receipt, shall not be installed. Only new undamaged equipment in first-class operating condition shall be installed.
- B. All equipment and piping shall be protected to prevent entrance of foreign matter and debris by covering exposed openings during construction.
- C. The fire protection contractor shall closely coordinate the ordering and delivery of all mechanical equipment with other trades to assure that equipment will be delivered in time to be installed in the building without requiring special or temporary access or building modifications. Certain equipment may have to be installed prior to the erection of the building walls or roofs.

#### 1.09 GUARANTY

- A. All fire protection work described in the contract documents shall be guaranteed for a period of one year from the date of final acceptance. This guaranty shall apply to all equipment, materials and workmanship. During the guaranty period, all defects shall be corrected in an acceptable manner, consistent with the quality of materials and workmanship of original construction, at no expense to the Owner.

#### 1.10 SHOP DRAWINGS

- A. It is the responsibility of the Fire Protection Subcontractor to coordinate the design with the work of all other disciplines so as to avoid conflicts. Where necessary piping shall be offset around ducts, structural members or other obstructions, while maintaining effective coverage, drains shall be provided per NFPA requirements.
- B. All required submittal data other than fire protection shop drawings shall be transmitted simultaneously in hard ring binders with the associated specification section and the item submitted clearly identified. Partial submittals will be returned without review unless previously agreed to by the Engineer.
- C. All fire protection drawing submittals shall be at 1/8" scale as a minimum. All submittals shall be in reproducible vellum or mylar format only, submittals of multiple prints will be returned without review.
- D. Fire Protection shop drawings shall include all data required by N.F.P.A. Section 13. Shop drawing plans shall indicate all lights, grilles, soffits, alarms, speakers and other ceiling components, as well as hydraulic node points, to insure coordination. The contractor shall submit shop drawings to and secure approval of the Owner's Underwriter, local authority and/or state authorities prior to submission to the Engineer. The contractor shall not commence work, purchase, or provide any materials to the job site without obtaining shop drawing approval from the above and the Engineer. Shop drawings shall include copies of all hydraulic calculations providing design densities, where applicable. In addition, shop drawings submittals shall include printed catalog specifications and data sheets for all of the following as applicable:
  - 1. Fire pump and controller (if provided).
  - 2. Jockey pump and controller (if provided)
  - 3. Fire department valves.
  - 4. Sprinkler heads and accessories.
  - 5. Siamese Fire Department connection.
  - 6. Fire valve cabinets.
  - 7. Test header.

9. Backflow preventor.
- E. A letter signed by an officer of the contractor's company shall be included in the submittal book that states the following items meet or exceed the requirements of the specifications:
  1. Pipe and fittings.
  2. Valves.
  3. Pipe supports.
  4. Pipe accessories.
  5. Pipe labels and valve tags.
  6. Flow switches.
  7. Tamper switches.
- F. All design drawings and calculations prepared by the Fire Protection subcontractor shall bear the seal of a registered professional engineer licensed in the state of the project or equivalent Fire Sprinkler Contractor's Certificate Seal.

#### 1.11 AS-BUILT DRAWINGS

- A. The Contractor shall maintain a record of all changes in the work from that shown in the contract documents. Prior to final acceptance by the Owner is completed, the Contractor shall prepare a set of "as-built" reproducible drawings of similar type and quality as the contract drawings that reflect all changes and that accurately show actual final construction, and transmit these drawings to the Architect. All concealed piping shall be dimensionally located from at least two column lines or major building structure. Drawings shall be a minimum of 1/8" scale.

#### 1.12 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Prior to final acceptance by the Owner, the Subcontractor shall provide three (3) copies of an Operations and Maintenance Manual, Bound, indexed, and titled in three-ring, loose-leaf binders. These manuals shall each contain the following:
  1. Clear and concise instructions for operation, maintenance, adjustment, lubrication, wiring diagrams and trouble-shooting data for all mechanical equipment. This information shall be prepared by manufacturer for particular size and model of equipment furnished.
  2. Parts list of all parts for equipment, with catalog numbers and other data necessary for ordering of replacement parts.
  3. Provide a competent manufacturer's service engineer for a minimum of two days to instruct the operating personnel including the interpretation of all equipment diagrams. A diary of the training sessions shall be made by the instructing manufacturer's service engineer and witnessed by the Owner's representative and shall be included in the as-built submittal.
  4. Copies of all approved equipment shop drawings, sprinkler layout drawings, hydraulic calculations and as-built plans shall be submitted with the Operation and Maintenance manual.
  5. Index shall include type of equipment, manufacturer, and local representative with address and phone number.

### **PART 2 PRODUCTS**

#### 2.01 FIRE PROTECTION SYSTEM MATERIALS

- A. All materials, pipe, valves and equipment furnished under this Section shall be new and approved by NFPA, Underwriter's Laboratories, Inc. (U.L.), Factory Mutual (F/M) and American Water Works

Association (AWWA) where applicable.

- B. The proposal submitted shall include all materials and equipment as specified or shown on the drawings. Proposed substitutions with difference in price, if any, shall be listed separately on the bid form at the time of submittal.
- C. Required materials not covered by the detailed specifications shall be of a suitable class, grade and type and shall be subject to the approval of the Engineer. Where two or more units of the same class or type of equipment are required, these units shall be the products of a single manufacturer.

## 2.02 PIPE, JOINTS AND FITTINGS

- A. Underground piping:
  - 1. Class 50 and 51 ductile iron pipe, bituminous coated outside, cement lined interior, ANSI A21.51 and A21.4.
    - a. Push-on or mechanical joints with neoprene gasket, 250 psi rating, ANSI A21.11.
    - b. Ductile iron mechanical joint fittings with neoprene gasket, bituminous coated outside, cement lined interior, 250 psi rating, ANSI A21.10.
    - c. Ductile iron flanged joints for all piping in vaults, red rubber gaskets, 250 psi rating, ANSI A21.15. Cadmium plated heavy hex machine bolts and nuts with bituminous coating field applied.
  - 2. Underground piping and installation shall be in accordance with the Insurance Underwriter's requirements and NFPA-24 and shall be installed with a minimum of 2'-6" of cover.
    - a. Trenching conditions for ductile iron pipe shall be Type 1 laying condition, ANSI A21.50.
- B. Aboveground piping:
  - 1. Schedule 40 welded or seamless steel pipe, ASTM A53 and A135.
    - a. Class 125 and 250 cast iron threaded fittings, ANSI B16.4.
    - b. Class 150 and 300 malleable iron threaded fittings, ANSI B16.3.
    - c. Class 125 and 250 cast iron flanged fittings, ANSI B16.1.
    - d. Schedule 40, 150 psi, forged steel butt weld fittings, ANSI B16.9.
    - e. Grooved mechanical couplings and fittings with EPDM gasket, malleable iron or ductile iron, 800 psi minimum rating ASTM A47 and A536, U.L. listed, F.M. approved.
  - 2. Lightwall welded or seamless steel pipe, ASTM A53 and A135.
    - a. Grooved mechanical couplings and fittings with EPDM gasket, malleable iron or ductile iron, 800 psi minimum rating ASTM A47 and A536, U.L. listed, F.M. approved.
    - b. Lightwall, 150 psi, butt weld fittings, ANSI B16.9.
- C. All interior sprinkler piping shall meet the requirements of applicable sections of NFPA, and the Owner's Underwriter. All pipe, fittings, valves, and sprinkler system components shall be rated for working pressures as required by system design.
- D. All pipe, supports and hanger assemblies shall be in accordance with NFPA-13 and shall be U.L. listed or FM approved.

## 2.03 VALVES AND ACCESSORIES

- A. Valves shall be installed where shown on the drawings and elsewhere as required by codes or standards. All valves shall be U.L. listed or F.M. approved for fire protection service. All valves shall be provided with remote alarm tamper switches compatible with the Owner's central alarm system to monitor valve

tampering. All switches and systems shall be Class A supervised. Provide 250 and 300 psi rated components at all locations as required by system pressure.

1. Gate Valves:
  - a. 2-1/2" and larger, Class 175 or 300, iron body, bronze mounted, solid wedge, outside screw and yoke, flanged ends, Stockham G-634 or F-670, listed for fire service.
  - b. 2" and smaller, Class 175, bronze body and trim, solid wedge, outside screw and yoke, threaded ends, Stockham B-133.
  - c. Provide U.L. listed pressure regulating valves at all locations required due to system pressure. Valves shall be Potter Roemer Series 4000 or approved equal.
2. Butterfly Valves:
  - a. 4" and larger, Class 175, iron body, aluminum bronze disc, wafer or lug style, EPDM gasket, Stockham LG-52U.
  - b. 2" and smaller, Class 175, bronze body, stainless steel disc threaded ends, Milwaukee BB-FP.
3. Check Valves:
  - a. 2-1/2 in. and larger, Class 125, iron body, bronze disc, flanged or threaded ends, Stockham G-931 and G-927.
  - b. 2-1/2 in. and larger, Class 125, iron body, bronze trim, flanged ends, Milwaukee 1800 series, flanged, U.L. listed for fire service.
  - c. 4 in. and larger, Mission fig. U-12 HMP, wafer body, U.L. listed for fire service.
4. Backflow Preventors:
  - a. Double detector check assembly shall be a complete assembly with two independently operating check valves mounted in a common body, two gate valves and four test cocks, designed for horizontal installation. All valves shall be provided with tamper switches. The complete assembly shall be U.L. listed, F.M. approved designed to specifications and/or requirements of USC, CCCL, AWWA and ASSE and shall be sized for the full fire flow demand at a maximum of 6 psi pressure drop.
    - 1) Double detector check backflow preventors shall be a Watts No. 770, Hersey Model DDC II or approved equal.
5. Fire Department Valves:
  - a. Fire Department valve shall be 2-1/2" cast brass body, 300 lb. rating, female N.P.T. inlet, male hose thread outlet, complete with cap and chain, brass finish. Valve shall be Potter Roemer Fig. 4065 or approved equal.
  - b. Provide U.L. listed pressure regulating valves at all locations as required by system pressure. Valve shall be Potter Roemer 4000 Series or approved equal.
6. Siamese Fire Department Connection:
  - a. Fire department connection shall be 2-way exposed Siamese type, 2-1/2" x 2-1/2" x 4" size, cast brass body, polished chrome finish for all exposed surfaces, cast brass escutcheon, and brass female hose inlets having individual clapper valves, plugs, and chains. Assembly shall be located with the center line of the hose inlets at 2'-6" above adjacent grade. Inlet threading shall be National Standard or same as municipal fire department, as required. Assembly shall be U.L. listed, FM approved. Wall Mounted: Potter Roemer 5710 series or approved equal. Free Standing: Potter Roemer 5760 series or approved equal.
7. Fire Valve Cabinet:
  - a. Cabinet shall be 20 gauge steel with polyester coating, recessed with flush full metal hinged door with 2-1/2" fire department valve and 1-1/2" hose reel of 75 ft. length. Cabinet shall be Potter-Roemer 1204 series or approved equal.

#### 2.04 AUTOMATIC SPRINKLER SYSTEM MATERIALS

- A. The underground fire protection service shall be provided with thrust blocks and rods and clamps at the service entry.
- B. Automatic sprinklers shall be provided as follows:
1. Public Spaces with ceilings:
    - a. Fully concealed type sprinklers, glass element or fusible link style, fast response, high sensitivity sprinklers shall be provided in all areas with gypsum ceilings unless otherwise noted. Temperature rating of sprinklers shall be 155E - 165E. Ceiling coverplate shall be factory painted to match the adjacent ceiling color, submit painted sample to the Architect for approval. Sprinkler to be Viking Horizon Mirage concealed sprinkler or approved equal.
  2. Non-Public Spaces with ceilings:
    - a. Small frame glass element, semi-recessed, fast response pendent sprinklers shall be provided in all areas with lay-in ceilings unless otherwise noted. Temperature rating of sprinklers shall be 155E-165E. Sprinkler and escutcheon to be polished chrome finish. Sprinkler to be Viking Microfast Model M series with Model E-1 escutcheon.
  3. Spaces with no ceiling:
    - a. Fast response upright pendent sprinklers shall be provided in all areas with no ceiling. Temperature rating is to be 165E unless conditions require higher temperature. Finish of sprinkler to be rough brass. Sprinkler to be Viking Microfast Model M.
    - b. A chrome finish will be provided on the sprinklers in all public areas.
  4. Areas on the exterior:
    - a. Standard response upright pendent sprinklers shall be provided in the parking garage areas supplied from the dry pipe system. All sprinklers shall have F.M. approved corrosion protection. Temperature rating is to be 165E unless conditions require higher temperature. Finish of sprinkler to be rough brass. Sprinkler to be Viking Micromatic Model M.
  5. Exterior overhangs and elevator shafts:
    - a. Standard response chrome plated dry horizontal sidewall or upright sprinklers are to be provided. Barrel length shall be a minimum of 12". Sprinkler and escutcheon shall be polished chrome finish. Sprinkler shall be Viking Model M or approved equal.
  6. Alternate acceptable manufacturers with equivalent sprinklers are Automatic, Grinnell, Gem and Reliable.
  7. Sprinkler guards shall be installed on all sprinklers 7'-0" or less above floor.
  8. Provide sprinklers at the highest and lowest level of all stairwells.
  9. The Subcontractor shall furnish and install a cabinet located in the fire service entry room with the number of each type of sprinklers and wrenches as required by N.F.P.A. No. 13.
  10. The Subcontractor shall provide and place suitable signs indicating the purpose of each control valve, test connection, main and auxiliary drain, etc., as required.
  11. Provide higher intermediate temperature rated sprinklers in all areas required due to service conditions and as required by NFPA 13.

#### 2.05 TESTS AND DRAINS

- A. The subcontractor shall provide test connections as required and as indicated on the drawings. Inspector's test connections shall be fitted with sight glasses and the discharge of the drain riser shall be terminated above an adjacent hub drain with an air gap fitting. All tests shall have approved sight test assemblies as required by NFPA.

2.06 ELECTRIC MOTORS AND RELAYS

- A. Design, type and ratings of electric motors shall comply with the National Electrical Code, NEMA and Underwriters Laboratories.
- B. Unless otherwise noted, or required for special applications, motors shall be equipped with sealed ball bearings.
- C. All motors to be mounted on equipment supplied under this Section shall be as manufactured by General Electric, Westinghouse, or Louis Allis.

2.07 PIPING AND EQUIPMENT IDENTIFICATION

- A. A marker showing the service and an arrow indicating the direction of flow shall be applied on the following equipment installed under this Section of the Specifications:
  - 1. All above ground fire protection standpipe and sprinkler piping.
  - 2. All above ground sprinkler drainage piping.
- B. Piping identification shall be applied in areas of exposed construction and in areas with accessible or lay-in ceilings. The piping shall be labeled at each valve, wall and floor penetrations (both sides) and at connections to equipment. In addition, straight runs of piping shall be labeled at intervals not greater than 25 feet.
- C. Equipment and component parts thereof shall bear manufacturer's nameplate, giving manufacturer's name, size, type model number or serial number, and electrical characteristics, to facilitate maintenance and replacements. Nameplates of distributors or Subcontractors are not acceptable. Electrical equipment shall be U.L. listed as applicable.
- D. The letter size and background color shall conform with the Identification of Pipe System ANSI A-13-1. The vinyl plastic markers shall be as manufactured by Seton Name-Plate Company, W.H. Brady Company, or Westline Products.
- E. All valves shall have a 1-1/2 inch diameter laminate plastic tag, engraved, black and white marking and a brass hook for attaching to valve stem. Tags shall have letters as large as practical, the number of the valve and the service such as indicated on the "Legend". The numbers of service shall be consecutive. Tags shall be similar to Seton 2961.
- F. All valves on pumps shall be similar to the valve tags specified above, except they shall be 2-1/2 inches in diameter, black with white number 2 inches high for attaching to valve stem by means of brass hook or small solid link brass chain. Tags shall be similar to Seton 2961-25.
- G. These numbers shall correspond with numbers indicated for valves and controls on two printed detailed lists and locational diagrams. These printed lists and locational diagrams shall state the numbers and locations of each valve and control and the section which it controls.
- H. The printed lists shall be prepared by Wrico pencil lettering or typed and shall be framed under glass, and mounted as directed by the Engineer.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. The Drawings are diagrammatic and the final arrangement of the work shall suit field conditions, the characteristics of the materials used and coordination with all other disciplines and the building components and finishes. Verify all dimensions in the field.  
  
Access and clearances must be provided and maintained for the proper operation, maintenance service and repair of the work.
- B. All standpipe, sprinkler and drain piping exposed to sight in stairwells is to be painted with two coats of an epoxy based paint, color to be selected by the Architect.
- C. All equipment and materials shall be installed according to manufacturer's recommendations and shall meet the requirements of NFPA and the Owner's Insurance Underwriter.
- D. All sprinklers in spaces visible to public view shall be located symmetrically in relation to ceiling design elements, lighting fixtures, speakers, diffusers, etc. All ceiling components are to be indicated on the submittal drawings as noted previously to insure coordination with all ceiling elements and devices. Piping to sprinklers in these areas are to be provided with return bends if required to allow for exact placement of sprinklers.
- E. Sprinklers shall be installed at the centerpoint of all 2' x 2' lay-in ceiling tiles, and at the centerpoint or 1' from the ends of 4' x 2' ceiling tiles.
- F. Where pipe is installed above suspended ceilings, it shall be located in the clear space above the suspended ceiling and the pendent sprinklers shall be located to clear the ceiling supporting grid system, the ceiling mounted fixtures, and air conditioning ducts and outlets.
- G. The Subcontractor shall install additional pendent sprinkler heads under all ductwork or other obstructions which is over 48 inches wide in accordance with NFPA-13 in areas of exposed construction.
- H. All sprinkler heads located in areas that will be painted shall be protected prior to painting.

#### 3.02 PREPARATION

- A. Arrangements shall be made to have the openings, inserts, sleeves, blockouts, and such other incidentals set in place ahead of the construction work, where practical, to eliminate the need of cutting and patching. If coring becomes necessary for installation of the work, it shall be done under this Section. All holes shall be neatly patched and finished to match the adjoining work in a manner approved by the Architect. All coring shall be performed in a manner not to weaken the structural parts and the manner and method shall be submitted to the Structural Engineer for approval.

#### 3.03 SLEEVES AND ESCUTCHEONS

- A. The Fire Protection Subcontractor shall furnish and set pipe sleeves and inserts for all work under this Section and shall be responsible for their proper and permanent location. In the event that failure to do so requires cutting and patching, it shall be by the Fire Protection Subcontractor.

- B. All pipes passing through floors, walls or partitions shall be provided with sleeves having an internal diameter 1-1/2 inches (3/4 inches annular space) larger than the outside diameter of the pipe or insulation on covered lines, except as otherwise specified herein.
- C. Sleeves for all pipes through walls, beams and partitions shall finish flush with the finish line of the walls, beams and partitions.
- D. Sleeves for all piping shall extend 1/2 inch above finish floor, (except where under partitions, the sleeves shall be flush with the bottom of the partition) and after the installation of pipe shall be packed and made watertight with fire stopping sealant to maintain separations and fire ratings.
- E. Where pipes pass under footings and through exterior walls, sleeves shall be of galvanized steel pipe and shall be not less than 4 inches larger than the pipe being sleeved. Sleeves shall be made watertight where passing through waterproofed surfaces, exterior wall, and floor slabs on grade. Waterproofing shall be done by means of a steel slip on welding flange, continuously welded at the center of the sleeve and shall be painted with one coat of bitumastic paint inside and outside. The space between sleeve and pipe shall be packed with oakum to within two (2) inches of each face of the wall; (to within two inches of the top of sleeve at floors). The remaining space shall be packed and made watertight with a waterproof mastic. Mechanical expansion type rubber seals such as manufactured by Calpico Ind. and Thunderline Corporation are acceptable as alternate method of water proofing piping penetrations.
- F. Sleeves through floors or interior masonry walls shall be of galvanized steel pipe or wrought iron pipe size except where located in concealed pipe spaces where they may be of 22 gauge galvanized sheet steel if fire rating is maintained.
- G. Sleeves through interior masonry partitions shall be of 22 gauge galvanized sheet steel.
- H. Sleeves for piping to receive insulation shall be large enough to allow continuous insulation through sleeves.
- I. Spacing between or location of pipe sleeves in floor slabs, structural beams or structural walls shall be subject to the Structural Engineer's approval.
- J. Where pipes pass under load bearing footings they shall pass through a coated steel pipe sleeve as described above and extend past a 45 degree line out from the bottom of the load bearing structure. Concrete shall be used as backfill in the portions of trench within the 45 degree pressure line.
- K. Escutcheons shall be provided around all exposed pipe passing through walls, partitions, ceilings and floors in finished spaces. Escutcheons shall be of sufficient outside diameter to cover the sleeve opening and shall fit snugly around the insulated or bare pipe and to the wall, partition, floor or ceiling.

#### 3.04 WORKMANSHIP

- A. All work shall be coordinated with the work to be performed or installed under other Sections of these Specifications.
- B. All work shall be executed in a workmanlike manner by workmen skilled in this type of work and shall present a neat appearance when completed.

- C. Offsets shall be provided as require to avoid interference and conflicts with other work, to maximize headroom, or to improve the appearance of pipe runs. All pipe supports, structural members, hangers and other apparatus necessary to support firmly and substantially the various components of the systems shall be provided under this Section.
- D. Nameplates, catalog numbers and rating identifications shall be securely attached to equipment with screws or rivets. Adhesives or cements will not be permitted.
- E. The Subcontractor shall be responsible for the protection of the work from injury and shall protect all apparatus with suitable enclosures.

### 3.05 ERECTION AND INSTALLATION

- A. Installation and workmanship requirements are specified hereinafter.
- B. This Subcontractor shall be responsible for the furnishing and installing of all support steel, hangers, rods, clamps, etc., to provide adequate support of all Fire Protection equipment specified herein. All support assemblies shall be U.L. listed or approved by Factory Mutual.

### 3.06 CLEANING OF SYSTEMS AND PREMISES

- A. At all times, keep the premises clear of undue accumulation of rubbish.
- B. On completion of the work, remove all rubbish and debris resulting from this contract, and dispose of same.
- C. All equipment shall be thoroughly cleaned and left in a satisfactory condition for proper operation at project completion. All equipment shall be partially or fully re-painted as required to provide an appearance of new equipment.

### 3.07 TESTS

- A. Tests of all fire protection systems and equipment, underground and inside piping including alarm and detection devices, shall be scheduled with one week prior notification to a local representative of the Underwriter and the Engineer. All tests and test procedures shall be in accordance with the applicable NFPA standards. After completion of all tests, the "Contractor's Materials and Test Certificate" shall be submitted to the Engineer.
- B. The Subcontractor shall supply all materials, labor, utilities and power required for testing. Preliminary tests shall be performed to prove work is satisfactory prior to requesting a test inspection. Sectional tests shall be made before insulation or concealing any piping.
- C. Repair all defects disclosed by tests or, if required by the Engineer, replace defective work with new systems and materials at no additional cost to the Owner. Repairs to piping systems shall be made with new material. No caulking of screwed joints, cracks or holes will be accepted. Make tests in stages to facilitate work of others.
- D. The Subcontractor shall be responsible for the repair and/or replacement cost installed and finishes damaged by leaks, tests and/or repair and replacement of his work at no additional expense to the Owner.
- E. Prior to final acceptance by the Owner, submit the "Contractor's Material and Test Certificates" indicating

system compliance with all applicable sections of NFPA.

**3.08 SUBCONTRACTOR'S WARRANTY**

- A. The Subcontractor shall warrant all equipment and the installation to function properly for a period of one year from date of final acceptance of the work.
- B. Defects becoming apparent within the warranty period shall be repaired by the Subcontractor. In addition all damages to installed work and finishes resulting from such defects shall be the responsibility of this Subcontractor either to repair or replace to equal the existing installation.
- C. This warranty shall in no way obligate the Subcontractor to repair any and all damages resulting from accident or improper operation or care on the part of the Owner.

**END OF SECTION**



## SECTION 15 525 - ELECTRIC FIRE PUMP AND ACCESSORIES

### PART 1 GENERAL

#### 1.01 GENERAL REQUIREMENTS

- A. General Conditions: Refer to the General Conditions, the Supplementary General Conditions and the Special Conditions, all provisions of which apply to work under this section as if written in full herein.
- B. The scope of work in these Specifications and/or indicated on the drawings describes the design requirements for the electric fire pump, jockey pump, controllers and all required piping and accessories.

#### 1.02 SYSTEMS

- A. Systems and equipment to be provided under the Fire Protection design section shall be as listed below.
  - 1. Skid-Mount Fire Pump Assembly
  - 2. Packaged Fire Pump House Assembly
  - 3. Jockey Pump
  - 4. Fire Pump Controller & Transfer Switch
  - 5. Jockey Pump Controller
  - 6. Flow Meter
  - 7. Test Header

#### 1.03 DESIGN STANDARDS

- A. Fire pump assemblies and installations shall be in accordance with the requirements of the following codes, standards and design guides.
  - 1. National Fire Protection Associations (NFPA) Standards:
    - a. NFPA 20 - Installation of Centrifugal Fire Pumps, 1999
  - 2. Factory Mutual (F.M.) Approval Guide
  - 3. Underwriters Laboratories (U.L.)
  - 4. Owners Insurance Underwriter Requirements

### PART 2 PRODUCTS

#### 2.01 FIRE PUMP

- A. The contractor shall provide and install a skid-mounted fire pump assembly and fire pump house assembly designed in accordance with the requirements of NFPA 20- 1999. The fire pump shall be Underwriters Laboratories listed and approved by Factory Mutual for fire pump service at the specified rating. The system manufacturer will assume unit responsibility for the proper operation of the entire system as specified herein.
- B. The fire pump shall be of the double suction horizontal split-case design and shall be UL listed and FM approved. The pump will be designed to operate at a maximum of 3600 RPM and will provide a rated capacity of 750 GPM at a differential pressure 75 psi. At 150% of the rated capacity it shall develop at least 65% of its rated head and shall not exceed 140% of the rated head at zero capacity.
- C. Pump casing shall be cast iron with flanged suction and discharge connections. Flanges shall be equivalent to ANSI B16.1 flange ratings. Casing shall be split on the shaft centerline to allow access to

rotating elements without disturbing drive or alignment.

- D. Casing and impeller wear rings shall be renewable bronze rings locked in position to prevent rotation.
- E. Bearings shall be steel, grease lubricated and shall have a minimum B-10 life of 20,000 hours. The bearing housing shall be designed to flush lubricant through, and provide continuous cleaning of, bearing surfaces. Bearings shall be removable without removing the rotating element or dismantling the pump.
- F. Pump shaft shall be steel.
- G. Shaft sleeves shall be renewable, bronze slip-fit over the shaft, shall extend full length through the seal box, and shall be locked in place.
- H. Impellers shall be enclosed bronze double suction type hydraulically and dynamically balanced.
- I. Pump shaft seal shall be stuffing box design with split bronze glands.
- J. Pump and drive base shall be formed steel or cast iron with drain pan base. The pump shall be connected to the driving electric motor through a flexible coupling. Coupling shall have a formed sheet steel coupling guard, bolted to the base plate.
- K. Motor shall be open drip proof type with a 1.15 service factor. Motors shall comply with the provisions of NFPA 70, National Electric Code as described in NFPA 20. Horse power rating shall be as required for FM approval.
- L. The fire protection piping and fire pump shall be designed and sized to eliminate the requirement for a main relief valve.
- M. Pump shall be fitted with the following accessories:
  - 1. Automatic casing air relief vent.
  - 2. Casing drain cocks.
  - 3. Discharge pressure gauge (0-300 psig).
  - 4. Suction pressure gauge (30" Hg to 150 psig).
  - 5. Name plate with capacity, head, impeller diameter, speed, model number, and serial number.
  - 6. Eccentric suction reducer (if required).
  - 7. Concentric discharge increaser (if required).
  - 8. UL listed FM approved flow meter.
- N. Fire pump system shall be:
  - 1. Aurora Pump
  - 2. Fairbanks Morse Pump Co.
  - 3. Peerless Pump
  - 4. SyncroFlo, Inc.

## 2.02 FIRE PUMP CONTROLLER

- A. The fire protection contractor shall be responsible for coordinating voltages of all fire protection equipment requiring electric motors, switches and relays, including control circuiting.
- B. The motor controller assembly shall be listed by Underwriters Laboratories and approved by Factory

Mutual for fire pump service and for service entrance. It shall be compatible with the motor horsepower and voltage. The controller assembly shall have an integral automatic transfer switch and shall be of the combination manual and automatic reduced voltage, soft-start type.

- C. Controller cabinet shall be free standing NEMA 2 formed steel construction with baked enamel finish. All internal components shall be accessible from the front.
- D. The controller assembly shall be designed to withstand the fault current for minimum short circuit capacity delivered to the controller and shall be clearly indicated on the controller submittal. Coordinate the required rating of the controller with the electrical specifications and drawings.
- E. Controller shall include the following:
  - 1. All controller components, including circuit breaker and contactors shall be front mounted, front wired and front accessible for maintenance.
  - 2. Controller shall include a motor rated combination isolating disconnect switch/circuit breaker, mechanically interlocked and operated with a single externally mounted handle.
  - 3. Controller shall be supplied with a pressure switch with a range of 0-300 psi and have independent high and low pressure settings. The pressure switch shall be mounted inside the controller.
  - 4. Controller shall have externally mounted individual, visible and audible indicators for power or power failure available, low pressure, pump operation, local start, phase failure, phase reversal, interlock on, pump running and run timer on.
  - 5. The controller shall have externally mounted operators including start pushbutton, stop pushbutton and emergency run mechanism. The start pushbutton and emergency run mechanism shall be separate units and not combined.
  - 6. The controller shall have a solid state minimum running period timer set for one minute for each ten horsepower. The minimum run timer shall include a flange mounted timer running pilot light to indicate when the run timer is in the timing mode.
- F. Controller shall include the following remote alarm features for remote annunciation at the main fire alarm control panel:
  - 1. Pump running light.
  - 2. Loss of phase/powerlight.
  - 3. Phase reversal light.
  - 4. Transfer switch normal.
  - 5. Transfer switch emergency.
- G. The controller shall be completely assembled, wired, and factory tested by the system manufacturer.
- H. Fire Pump Controller shall be:
  - 1. Cutler-Hammer
  - 2. Firetrol
  - 3. Hubbell Controls
  
  - 4. Joslyn Clark
  - 5. Master Controls

### 2.03 JOCKEY PUMP

- A. Jockey Pump shall be a vertical multi-stage centrifugal type, coupled to an open drip proof motor.

- B. Pump casing shall be cast iron with 200 PSIG minimum operating pressure.
- C. Pump shall be bronze fitted and supplied with a relief valve between the pump and check valve.
- D. Jockey pump shall be same manufacturer as the fire pump or by Grundfos Pump Corporation.

#### 2.04 JOCKEY PUMP CONTROLLER

- A. Jockey pump controller shall be combined manual/automatic type assembled, wired, and tested at the factory. Assembly shall be Underwriters Laboratories labeled and Factory Mutual approved.
- B. Jockey pump controller cabinet shall be NEMA 2 formed steel construction with baked enamel finish. All internal components shall be accessible from the front.
- C. Controller shall include the following:
  - 1. One externally operated fusible disconnect switch.
  - 2. One front mounted hand-off-auto select switch.
  - 3. One running period timer to keep motor running for a predetermined time after each automatic start.
  - 4. One prepped mercoid pressure switch.
- D. Jockey pump controller shall be same manufacturer as fire pump controller.

#### 2.05 FLOW METER

- A. Flow meter shall be U.L. listed, FM approved annubar type designed for mounting in pipe. Flow meter shall have a water flow capacity of 175% of pump rated capacity. Flow meter shall be provided with annubar flow sensor, valved high and low side connections, a flow indicator and interconnecting tubing. Flow meter element and indicator shall be sized for pump rated capacity.

#### 2.06 TEST HEADER

- A. Test header shall be three outlet, horizontal flush mount outlet style complete with 2-1/2" fire department valves, caps and chains. All exposed surfaces shall be polished chrome plated. Hose connection shall comply with local fire department requirements. Assembly shall be located 2'-6" above finished grade to the centerline of the valve outlets. Test header shall be Potter Roemer 5860 series or approved equal.

### **PART 3 EXECUTION**

#### 3.01 INSTALLATION

- A. Fire Pump System shall be installed in accordance with NFPA 20 and as indicated on the drawings.
- B. Controllers shall be installed in accordance with NFPA 20.
- C. Flow meter shall be installed in accordance with manufacturer's instructions.
- D. Fire pump and jockey pump pressure control sensors shall be installed in accordance with NFPA 20.
- E. Sprinkler system pipe, fittings and valves shall be of the pressure rating required to eliminate the requirement for a main relief valve on the fire pump.

- F. Fire pump drip pan base shall be piped to floor drain.
- G. All equipment will be factory tested in accordance with the requirements of NFPA, UL and FM. Additionally, the entire system shall be hydrostatically tested fully assembled by the system manufacturer prior to shipment.

**3.02 SUBMITTAL DATA**

- A. The submittal data for the pumping system shall include, but not be limited to: pump curves, individual computer data sheets, system drawings, and complete description of control panel, with wiring diagram, sequencing data, instrumentation, and alarms.
- B. The pumping system shall be guaranteed in writing by the manufacturer for a period of one year from final acceptance by the Owner.
- C. The service of a factory trained representative shall be made available on the jobsite to check installation, field acceptance testing, start-up, and instruct operating personnel.

**END OF SECTION**



## SECTION 15 606 - ELECTRIC UNIT HEATERS

### PART 1 GENERAL

#### 1.01 GENERAL REQUIREMENTS

- A. All work specified herein shall be accomplished in accordance with the applicable requirements of Section 15010, General Requirements for Heating, Ventilating and Air Conditioning.

#### 1.02 WORK INCLUDED

- A. Receipt, unloading, handling, proper storage and protection from damage of all materials.
- B. Layout and coordination of work with other trades.
- C. The work under this Section shall include all labor, materials, accessories, services, and equipment necessary to furnish and install electric unit heaters complete as indicated on the Drawings and as specified herein.

### PART 2 PRODUCTS

#### 2.01 UNIT HEATERS

- A. Unit shall be of the horizontal or vertical blow-thru propeller fan type.
- B. Casing shall be constructed of 18 gauge die-formed, furniture grade steel, phosphate coated and finished in baked enamel.
- C. Electric heating element shall be a resistant wire enclosed in a steel sheath with fins.
- D. Fan shall be direct drive, propeller type, designed for unit heater application.
- E. Motor shall be totally enclosed, thermally protected continuous duty selected to match fan requirements.
- F. Unit shall be provided with manufacturer's standard mounting bracket for either ceiling or wall mounting as required.
- G. Unit shall be equipped with individual adjustable louvers.
- H. Wiring of unit heater shall be designed for a single source power connection with elements, motor and control circuits subdivided and fused to conform to the latest National Electrical Code, OSHA and U.L., Inc., Standards. All three phase heaters shall have balanced phases. A non-fused disconnect switch factory wired shall be provided. Control circuit voltage shall not exceed 120 volts.
- I. Unit heater shall be equipped with an automatic reset linear thermal cut-out, a fan delay switch, control circuit transformer and either a wall mounted or unit mounted thermostat as shown on the drawings.
- J. Units shall be Raywall, Q-Mark, Markel, Trane, Modine or approved equal.

### PART 3 EXECUTION

3.01 INSTALLATION

- A. All units shall be installed in strict accordance with the manufacturer's recommendations.

**END OF SECTION**

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**SECTION 15 867 - MODULAR CENTRAL STATION AIR HANDLING UNITS**

**PART 1 GENERAL**

1.01 WORK INCLUDED

- A. Packaged Air Handling Units.

1.02 RELATED WORK

- A. Division 1 - Temporary Heating, Cooling, and Ventilating.
- B. Section 15170 - HVAC Insulation.
- C. Section 15901 - Adjustable Frequency Drives

1.03 REFERENCES

- A. ARI 430 - Standard for Central Station Air Handling Units.
- B. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- C. ANSI/AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
- D. SMACNA - HVAC Duct Construction Standards.
- E. ARI 410 - Standard for Forced Circulation Air-Cooling and Air-Heating Coils.
- F. ANSI/UL 900 - Test Performance of Air Filter Units.
- G. AMCA 300 - Reverberant Method for Sound Testing of Fans.
- H. AMCA 301 - Method for Publishing Sound Ratings for Air Moving Devices.
- I. ASHRAE 68 - Laboratory Method of Testing In-Duct Sound Power Measurement Procedure for Fans.

1.04 QUALITY ASSURANCE

- A. Air Handling Units: Product of manufacturer regularly engaged in production of components who issues complete catalog data on total product offering.
- B. Constant Volume Air Handling Units: Certify air volume, static pressure, fan speed, brake horsepower and selection procedures in accordance with ARI 430. If air handling units are not certified in accordance with ARI 430, contractor shall be responsible for expenses associated with testing of units after installation to verify capacities of fans. Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor.
- C. Variable Air Volume Air Handling Units with Adjustable Frequency Drive: Certify air volume, static pressure, fan speed, brake horsepower and selection procedures in accordance with ARI 430. If air

handling units are not certified in accordance with ARI 430, contractor shall be responsible for expenses associated with testing of units after installation to verify capacities of fans. Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor. Refer to Section 15901 - Adjustable Frequency Drives.

- D. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with ARI 410-87.

#### 1.05 SUBMITTALS

- A. Submit as-built drawings and product data under provisions of Section 15010.
- B. As-built drawings shall show total unit configuration in direction of airflow, unit dimensions, and field duct connection details.
- C. Product data shall indicate dimensions, weights, coil performance, fan performance, motor electrical characteristics, finishes of materials, filter media, filter sizes, and filter quantities.
- D. Submit manufacturer's installation instructions under provisions of Section 15010.
- E. Provide fan curves with specified operating point clearly plotted. Fan curves shall indicate air volume, static pressure, fan speed and brake horsepower.
- F. Submit sound power levels by octave band for air handling units at scheduled design conditions. Provide sound power levels for "discharge" and "inlet plus cabinet" sound paths in accordance with AMCA 300 or ASHRAE 68 and AMCA 301.

#### 1.06 OPERATION AND MAINTENANCE DATA:

- A. Submit operation and maintenance data under provisions of Section 15010.
- B. Include instructions for lubrication, filter replacement, motor and drive replacement, belt tension adjustments, and wiring diagrams.

#### 1.07 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver products to site under provisions of Section 15010. Units shall ship fully assembled on factory-installed base rails/mounting legs up to practical shipping and rigging limitations. Units not shipped fully assembled shall have tags and airflow arrows on each section to indicate location and orientation in direction of airflow. Each section shall have lifting lugs or shipping skid to allow for field rigging and final placement of section.
- B. Deliver units to site with fan motors, sheaves, and belts completely assembled and mounted in units. Mount motors as specified in Paragraph 2.05.
- C. Provide shrink-wrap for all sections of the air handling units while in transit and storage, prior to installation. If shrink-wrap is not available, provide an enclosed truck or full enclosure by tarp for equipment during transit and on the jobsite prior to installation.

- D. Store and protect products under provisions of Section 15010.
- E. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

**PART 2 PRODUCTS**

2.01 ACCEPTABLE MANUFACTURERS

- A. Trane Company; Model: Modular Climate Changer
- B. York; Model: Airpak
- C. Carrier; Model: 39 M
- D. McQuay; Vision Model

2.02 GENERAL

- A. Manufacturer must clearly define any exceptions made to Plans and Specifications. Mechanical Contractor is responsible for expenses that occur due to exceptions made.
- B. Fabricate draw-thru type unitary air handling units with fan sections, coil sections, access sections, filter sections and discharge plenums.
- C. Factory fabricate air handling units of sizes, capacities, and configurations as scheduled on drawings.
- D. Provide factory installed 5" (8") tall base rails/mounting legs to support all sections of units. Construct base rails/mounting legs of minimum 10 gauge galvanized steel channels or I-beams. Base rails/mounting legs shall have enough height to ensure proper trapping of condensate of all air handling units. Base rail/mounting legs not constructed of galvanized steel shall be chemically cleaned, coated with rust inhibiting primer, and finished with rust inhibiting enamel.

2.03 CASING

- A. Construct casings of minimum 16 gauge G90-U galvanized steel structural frames. Unit exterior panels shall be constructed of minimum 18-gauge mill galvanized steel. Casings shall be double wall and minimum 20 gauge G90-U galvanized steel interior panels. Floor panels shall be minimum 16 gauge galvanized steel with reinforcements to support the weight of maintenance personnel.
- B. Plenum fan section interior liner shall be perforated aluminum or stainless steel in lieu of solid galvanized panels. Perforated galvanized panels are unacceptable due to lack of rust protection inside the holes.
- C. Construct casing sections located upstream of supply fan for operation at 4 inches water gage negative static pressure and casing sections located downstream of supply fan for operation at 6 inches water gage

positive static pressure. Seal joints between casing sections with closed-cell foam gasketing for leak seal and thermal and acoustical break.

- D. Panels shall be fully removable to allow for a proper way to thoroughly clean panels of microbial growth and to access internal parts. Secure panels to structural frames with zinc chromated plated screws. Seal joints between exterior panels and structural frames with closed-cell foam gasketing for leak seal and thermal and acoustical break.
- E. Casings not constructed of G90-U galvanized steel, casings with welds on exterior surfaces, or casings with welds on interior surfaces that have burned through to exterior surfaces shall be chemically cleaned, coated with rust inhibiting primer, and finished with rust inhibiting enamel in order to prevent premature corrosion and microbial growth.
- F. Casing shall have removable access panels or doors as scheduled on drawings. Construct access doors of minimum 18 gauge G90-U galvanized steel exterior panels and minimum 22 gauge G90-U galvanized steel interior panels. Provide automotive style neoprene gasketing around full perimeter of access doors to prevent air leakage. Provide "ventlock" style non-corrosive alloy latches operable from the inside or outside of unit. If access doors do not open against unit operating pressure, provide safety latches that allow access doors to partially open after first handle movement and fully open after second handle movement. Insulate access doors with 2 inch thick 1-1/2 pound per cubic foot density matt faced fiber glass insulation.
- G. Insulate casing sections with 1 inch thick 3 pound per cubic foot density matt faced fiber glass insulation. Casing shall have 1 2-inch minimum thickness dual density fiberglass insulation not less than 1-1/2 lbs. per cub. ft. The panel insulation must be a full 2" throughout the entire unit. Units with less than 2" of insulation in any part of the walls, floor, roof or drain pan shall not be acceptable. Insulate all structural channels connected to casing panels and cover openings in structural channels with galvanized steel. If structural channels are not internally insulated, then structural channels must be wrapped with an armaflex type insulation. Any portion of the unit that is not insulated (gaps) or has less than 2" of insulation shall be the responsibility of the contractor to modify. Insulation shall comply with NFPA 90A.
- H. Provide sealed double wall drain pans constructed of minimum 18 gauge G90-U galvanized steel exterior and stainless steel interior. Encase manufacturer's standard insulation between exterior and interior walls. Drain pans shall be sloped in 2 planes; cross break interior pans and pitch toward drain connections to ensure complete condensate drainage.

#### 2.04 FANS

- A. Provide supply fan sections with forward curved (or airfoil, see schedule) double width, double inlet centrifugal fan designed and suitable for class of service indicated in the unit schedule. Fan shaft to be properly sized and protectively coated with lubricating oil. Fan shafts shall be solid and properly designed so that fan shaft does not pass through first critical speed as unit comes up to rated RPM. Fans shall be statically and dynamically tested as an assembly at the required RPM to meet design specifications. Key fan wheels to fan shaft to prevent slipping.
- B. Provide self-aligning, grease lubricated pillow-block ball bearings selected for L-50 200,000 hour average life per ANSI/AFBMA 9. Extend grease lubrication fittings to drive side of unit with plastic tubes and zerk fittings rigidly attached to casing.

- C. Mount fans on minimum 16 gauge steel isolation bases. Internally mount motors on same isolation bases and internally isolate fans with 2 inch housed spring isolators. Install flexible canvas ducts between fan and casings to ensure proper isolation and prevent vibration and noise from being transmitted through the unit and ductwork. Flexible canvas ducts shall comply with NFPA 90A. If no flexible canvas duct is provided, then the entire unit shall be externally isolated from the supply duct work and piping by contractor.
- D. Fan sections shall have full height, double wall, hinged, removable access doors on drive side for inspection and maintenance of internal components. Construct doors in accordance with Paragraph 2.03.E
- E. Statically and dynamically balance fan section assemblies. Fan section assemblies include fan wheels, shafts, bearings, drives, belts, isolation bases and isolators. Allow isolators to free float when performing fan balance. Measure vibration at each fan shaft bearing in horizontal, vertical and axial directions. Balance at design RPM's furnished by manufacturer.

#### 2.05 MOTORS AND DRIVES

- A. Factory install all motors on slide base to permit adjustment of belt tension.
- B. Fan Motors shall be heavy duty, high efficiency open drip proof type. Motors shall meet Table MG-1-12C of EPACK '92.
- C. V-Belt Drive shall be constant pitch rated at 1.5 times the motor nameplate.
- D. Motors shall be selected with a minimum of 15% safety factor greater than the fan brake/horsepower (e.g. 4.75 BHP would require a nominal 7-1/2 HP motor). The motor service factor shall not be used as part of the safety factor.
- E. Motors controlled by an adjustable frequency drive shall be compatible with the particular manufacturer's drive that is used.

#### 2.06 COILS

- A. Coils shall be manufactured by the same company as the supplier of the air handling unit. Install coils such that headers and return bends are enclosed by unit casings.
- B. Construct coils of configuration plate fins and seamless tubes. Fins shall have collars drawn, belled and firmly bonded to tubes by means of mechanical expansion of tubes. Do not use soldering or tinning in bonding process.
- C. Construct coil casings of minimum 16 gauge galvanized steel with formed end supports and top and bottom channels. If two or more coils are stacked in unit, install intermediate drain channels between coils to drain condensate to main drain pans without flooding lower coils or passing condensate through airstream. The cooling coil segments shall have a full width, sloped drain pan that extends downstream of the coil a minimum of 12". The unit design shall not require a drain pan in any downstream section to contain the coil condensate. Drain pans shall be sloped in 2 planes; cross break interior pans and pitch toward drain connections to ensure complete condensate drainage. Units with cooling coils shall have drain pans under complete cooling coil section. A minimum of 1" clearance shall be provided from the bottom of coil casing to the drain pan so that the drain pan can be visually inspected and physically cleaned, including underneath coil, without removal of the coil. All drain pan connections will be to one side of the unit to enable proper trapping.

- D. Staggered coil arrangements are not acceptable.
- E. Water Cooling Coils
  - 1. Clearly label supply and return headers on outside of units such that direction of coil water-flow is counter to direction of unit air-flow.
  - 2. Coils shall be proof tested to 300 psig and leak tested to 200 psig air pressure under water.
  - 3. Construct headers of round copper pipe or cast iron.
  - 4. Construct tubes of 1/2 inch or 5/8 inch O.D. copper and construct fins of aluminum. Fins or air handling units with greater than 25% outside air shall be constructed of copper.
  - 5. Coils shall be slide-out "shipping" type, mounted on tracks to allow replacement by removing only one wall panel. "Unit" type coils built as an integral part of the coil section are not acceptable.

#### 2.07 FILTERS

- A. Provide factory fabricated filter section of the same construction and finish as unit casings. Filter sections shall have filter guides and full height, double wall, hinged, removable access doors for filter removal. Construct doors in accordance with Paragraph 2.03.E. Filter sections shall flange to other unit components. Provide filter blockoffs as required to prevent air bypass around filters.
- B. Filters for air handling units shall be UL Class II replaceable type. Pleated filters shall be 2" depth, 30-35% efficiency type. Provide one extra set of pre-filters for use during construction and replace following Owner Acceptance. Filter face velocities shall not exceed 500 FPM.

### PART 3 EXECUTION

#### 3.01 EQUIPMENT

- A. Unit shall be run tested at factory before shipping.

#### 3.02 INSTALLATION

- A. Unit shall be installed level within manufacturer's recommendations.
- B. Protect units with temporary filtration on return air inlet to prevent construction dust from entering unit from start-up to final turnover.

**END OF SECTION**

## SECTION 15 868 - FAN POWERED INDUCTION UNITS

### PART 1 GENERAL

#### 1.01 DESCRIPTION

- A. All work specified in this Section is subject to the provisions of Section 15010.
- B. Fan powered induction units (PIU) shall be provided to meet the minimum capacities scheduled, shall meet all constraints of construction, and shall comply with all specifications Sections.

#### 1.02 COORDINATION

- A. The units of one manufacturer have been used as the basis of design. Any modifications to ductwork, wiring, controls, building structure, etc., that result from the use of any other units shall be coordinated with all trades; this coordination shall occur before delivery of equipment from the manufacturer. Any modifications shall be performed without incurring additions to the Contract.

#### 1.03 ACCEPTABLE MANUFACTURERS

- A. Fan powered units shall be by Trane, Carrier, Titus, Price or Krueger.

### PART 2 PRODUCTS

#### 2.01 DESCRIPTION

- A. Powered induction units shall be factory fabricated complete with variable air volume fan powered induction section, backdraft damper for fan section, acoustically lined plenum section, factory mounted electric or hot water heating coil, as scheduled and DDC operator.
- B. VAV controller shall be as specified in Section 15150.
- C. Intermittent operation fan powered induction section shall consist of:
  - 1. An acoustically lined sheet metal housing and centrifugal direct drive fan wheel.
  - 2. Resiliently mounted, permanently lubricated, 3-speed, PSC motor of the voltage shown on the electrical drawings. In lieu of 3-speed motor, a speed controller will be acceptable.
  - 3. Maintenance-free backdraft damper to prevent reverse flow through blower.
  - 4. Manual damper for volume control.
- D. Plenum section shall be acoustically lined and shall receive air from either the primary VAV controller or the induction fan, and distribute the air through the low pressure duct system. Parallel (side by side) discharge is unacceptable.
- E. Constant operation fan powered induction unit shall consist of same items except backdraft damper. Fan shall run constantly, and shall receive a mixture of primary air and return air as required to maintain space conditions.
- F. Controls shall be DDC compatible with the temperature controls.

- G. The maximum acceptable NC at the unit discharge is 40 at 1.5" inlet static pressure; the maximum acceptable radiated NC is 40 at 1.5" inlet static pressure. The maximum pressure drop through the unit shall be 0.3" W.C.

#### 2.02 HEATING COILS

- A. All heating coils shall have the capacity listed on the drawings and shall be factory mounted and tested.
- B. Coils shall be rated in accordance with ARI-410.

### **PART 3 EXECUTION**

#### 3.01 INSTALLATION

- A. Units shall be installed as indicated and in conformance with the manufacturer's recommendations. Coordinate the actual units to be provided with all trades.

#### 3.02 ADJUSTMENT

- A. The units shall be tested and adjusted to provide the scheduled capacities.

**END OF SECTION**

**SECTION 15 901 - ADJUSTABLE FREQUENCY DRIVES (2 TO 400 HP)**

**PART 1 GENERAL**

1.01 DESCRIPTION

- A. This specification is to cover a complete adjustable frequency motor drive (AFD) consisting of a pulse width modulated (PWM) inverter for use on a standard NEMA Design B induction motor. The drive shall be manufactured in the USA. The drive shall be manufactured by ABB or approved equals by Graham, AC Technologies, Eaton, Yaskawa (Magnetek) or Square D. The drive shall be designed specifically for variable torque applications. It is required that the drive manufacturer have an existing:
  - 1. Sales representative exclusively for HVAC products, with expertise in HVAC systems and controls.
  - 2. An independent service organization.
- B. The drive and all necessary controls, as herein specified shall be supplied by the drive manufacturer. Manufacturer shall have been engaged in the production of this type of equipment for a minimum of ten years.
- C. Provide integral bypass motor starter package.
- D. All drives on the project shall be by the same manufacturer.

1.02 QUALITY ASSURANCE

- E. Referenced Standards:
  - 1. Institute of Electrical and Electronic Engineers (IEEE)
    - a. Standard 519-1992, IEEE Guide for Harmonic Content and Control.
  - 2. Underwriters Laboratories
    - a. UL 508
  - 3. National Electrical Manufacturer's Association (NEMA)
    - a. ISC 6, Enclosures for Industrial Controls and Systems
  - 4. IEC 801-2, 801-4, 255-4
- F. Testing:
  - 1. All printed circuit boards shall be completely tested and burned-in before being assembled into the completed AFD. The AFD shall then be subjected to a preliminary functional test, minimum eight hour burn-in, and computerized final test. The burn-in shall be at 104E F (40E C), at full rated load, or cycled load. Drive input power shall be continuously cycled for maximum stress and thermal variation.
- G. Failure Analysis:
  - 1. AFD manufacturer shall have an analysis laboratory to evaluate the failure of any component. The failure analysis lab shall allow the manufacturer to perform complete electrical testing, x-ray components, and decap or delaminate components and analyze failures within the component.
- H. Qualifications:
  - 1. AFDs shall be UL Listed.
  - 2. AFDs shall be CUL listed or CSA Approved.

1.03 SUBMITTALS

- I. Submittals shall include the following information:
  - 1. Outline Dimensions
  - 2. Weight
  - 3. Typical efficiency vs. speed graph for variable torque load
  - 4. Compliance to IEEE 519 - Harmonic analysis for particular jobsite including total voltage harmonic distortion and total current distortion.
    - a. The AFD manufacturer shall provide calculations, specific to this installation, showing total harmonic voltage distortion is less than 5%. Input line filters shall be sized and provided as required by the AFD manufacturer to ensure compliance with IEEE standard 519-1992, Guide for Harmonic Control and Reactive Compensation for Static Power Converters. The acceptance of this calculation must be completed prior to AFD installation.
    - b. Prior to installation, the AFD manufacturer shall provide the estimated total harmonic distortion (THD) caused by the AFDs. The results shall be based on a computer aided circuit simulation of the total actual system, with information obtained from the power provider and the user.
    - c. If the voltage THD exceeds 5%, the AFD manufacturer is to recommend the additional equipment required to reduce the voltage THD to an acceptable level.

#### 1.04 WARRANTY

- J. Warranty shall be 24 months from the date of certified start-up, not to exceed 30 months from the date of shipment. The warranty shall include all parts, labor, travel time, and expenses.

### PART 2 - PRODUCTS

#### 2.01 ADJUSTABLE FREQUENCY DRIVES

- K. The adjustable frequency drives shall be solid state, with a Pulse Width Modulated (PWM) output waveform (VVI, six-step, and current source drives are not acceptable). The AFD package as specified herein shall be enclosed in a NEMA 1 enclosure, completely assembled and tested by the manufacturer. The AFD shall employ a full wave rectifier (to prevent input line notching), DC Line Reactor, capacitors, and Insulated Gate Bipolar Transistors (IGBT's) as the output switching device (SCR's, GTO's and Darlington transistors are not acceptable). The drive efficiency shall be 97% or better at full speed and full load. Fundamental power factor shall be 0.98 at all speeds and loads.
- L. Specifications for the 3 HP to 400 HP AFD at 480 Volts and 2 to 40 HP AFD at 230 volts:
  - 1. Input 440/460/480/500 VAC +/-10% (capable of operation to 550 VAC), 3 phase, 48 - 63 Hz or Input 208/220/230/240 VAC +/-10%, 3 phase, 48 - 63 Hz.
  - 2. Output 0 - Input Voltage, 3 phase, 0 to 500 Hz for drives up to 75 HP; 0 to 120 Hz for drives over 75 HP. Operation above 60 Hz. shall require programming changes to prevent inadvertent high speed operation.
  - 3. Environmental operating conditions: 0 to 40E C @ 3 kHz switching frequency, 0 to 3300 feet above sea level, less than 95% humidity, non-condensing.
  - 4. Enclosure shall be rated Type 1.
- M. All AFDs shall have the following standard features:
  - 1. All AFDs shall have the same customer interface, including digital display, keypad and customer connections; regardless of horsepower rating. The keypad is to be used for local control, for setting all parameters, and for stepping through the displays and menus.

2. The AFD shall give the user the option of either (1) displaying a fault, (2) running at a programmable preset speed, (3) hold the AFD speed based on the last reference received, or (4) cause a Warning to be issued, if the input reference (4-20mA or 2-10V) is lost; as selected by the user. The AFD shall provide a programmable relay output for customer use to indicate the loss of reference condition.
  3. The AFDs shall utilize plain English digital display (code numbers and letters are not acceptable). The LCD shall be backlit to provide easy viewing in any light condition. The contrast should be adjustable to optimize viewing at any angle. All set-up parameters, indications, faults, warnings and other information must be displayed in words to allow the user to understand what is being displayed without the use of a manual or cross-reference table.
  4. The AFDs shall utilize pre-programmed application macro's specifically designed to facilitate start-up. The Application Macros shall provide one command to reprogram all parameters and customer interfaces for a particular application to reduce programming time.
  5. The AFD shall have the ability to automatically restart after an overcurrent, overvoltage, undervoltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between reset attempts shall be programmable. If the time between reset attempts is greater than zero, the time remaining until reset occurs shall count down on the display to warn an operator that a restart will occur.
  6. The AFD shall be capable of starting into a rotating load (forward or reverse) and accelerate or decelerate to setpoint without safety tripping or component damage (flying start).
  7. The AFD shall be equipped with an automatic extended power loss ride-through circuit which will utilize the inertia of the load to keep the drive powered. Minimum power loss ride-through shall be one-cycle, based on full load and no inertia. Removing power from the motor is not an acceptable method of increasing power loss ride-through.
  8. The customer terminal strip shall be isolated from the line and ground.
  9. Prewired 3-position Hand-Off-Auto switch and speed potentiometer. When in "Hand", the AFD will be started, and the speed will be controlled from the speed potentiometer. When in "Off", the AFD will be stopped. When in "Auto", the AFD will start via an external contact closure, and its speed will be controlled via an external speed reference.
  10. The drive shall employ three current limit circuits to provide trip free operation:
    - a. The Slow Current Regulation limit circuit shall be adjustable to 125% (minimum) of the AFD's variable torque current rating. This adjustment shall  
  
be made via the keypad, and shall be displayed in actual amps, and not as percent of full load.
    - b. The Rapid Current Regulation limit shall be adjustable to 170% (minimum) of the AFD's variable torque current rating.
    - c. The Current Switch-off limit shall be fixed at 255% (minimum, instantaneous) of the AFD's variable torque current rating.
  11. The overload rating of the drive shall be 110% of its variable torque current rating for 1 minute every 10 minutes, and 140% of its variable torque current rating for 2 seconds every 15 seconds.
  12. The AFD shall have input line fuses standard in the drive enclosure.
  13. The AFD shall have a DC Line Reactor to reduce the harmonics to the power line and to increase the fundamental power factor.
  14. The AFD shall be optimized for a 3 kHz carrier frequency to reduce motor noise and provide high system efficiency.
  15. The AFD shall have a manual speed potentiometer in addition to using the keypad as a means of controlling speed manually.
- N. All AFDs to have the following adjustments:
1. Five (5) programmable critical frequency lockout ranges to prevent the AFD from continuously operating at an unstable speed.
  2. PI Setpoint controller shall be standard in the drive, allowing a pressure or flow signal to be

- connected to the AFD, using the microprocessor in the AFD for the closed loop control.
3. Two (2) programmable analog inputs shall accept a current or voltage signal for speed reference, or for reference and actual (feedback) signals for PI controller. Analog inputs shall include a filter; programmable from 0.01 to 10 seconds to remove any oscillation in the input signal. The minimum and maximum values (gain and offset) shall be adjustable within the range of 0 - 20 mA and 0 - 10 Volts. Additionally, the reference must be able to be scaled so that maximum reference can represent a frequency less than 60 Hz, without lowering the drive maximum frequency below 60 Hz.
  4. Six (6) programmable digital inputs for maximum flexibility in interfacing with external devices. One digital input is to be utilized as a customer safety connection point for fire, freeze, and smoke interlocks (Enable). Upon remote, customer reset (reclosure of interlock), drive is to resume normal operation.
  5. Two (2) programmable analog outputs proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power (kW), DC Bus voltage, or Active Reference.
  6. Three (3) programmable digital relay outputs. The relays shall be rated for maximum switching current 8 amps at 24 VDC and 0.4 amps at 250 VAC; Maximum voltage 300 VDC and 250 VAC; Continuous current rating 2 amps RMS. Outputs must be true form C type contacts; open collector outputs are not acceptable.
  7. Seven (7) programmable preset speeds.
  8. Two independently adjustable accel and decel ramps. These ramp times shall be adjustable from 1 to 1800 seconds.
  9. The AFD shall Ramp or Coast to a stop, as selected by the user.
- O. The following operating information displays shall be standard on the AFD digital display. The display shall be in complete English words (alpha-numeric codes are not acceptable):
- Output Frequency
  - Motor Speed (RPM, % or Engineering units)
  - Motor Current
  - Calculated Motor Torque
  - Calculated Motor Power
  - DC Bus Voltage
  - Output Voltage
  - Heatsink Temperature
  - Analog Input Values
  - Keypad Reference Values
  - Elapsed Time Meter
  - kWh meter
- P. The AFD shall have the following protection circuits. In the case of a protective trip, the drive shall stop, and announce the fault condition in complete words (alpha-numeric codes are not acceptable).
1. Overcurrent trip 315% instantaneous (225% RMS) of the AFD's variable torque current rating.
  2. Overvoltage trip 130% of the AFD's rated voltage
  3. Undervoltage trip 65% of the AFD's rated voltage
  4. Overtemperature +70E C (ACH 501); +85E C (ACH 502)
  5. Ground Fault either running or at start
  6. Adaptable Electronic Motor Overload (I2t). The Electronic Motor Overload protection shall protect the motor based on speed, load curve, and external fan parameter. Circuits which are not speed dependant are unacceptable. The electronic motor overload protection shall be UL Listed for this function.
- Q. Speed Command Input shall be via:

1. Keypad.
  2. Two Analog inputs, each capable of accepting a 0-20mA, 4-20mA, 0-10V, 2-10V signal. Input shall be isolated from ground, and programmable via the keypad for different uses.  
Analog inputs shall have a programmable filter to remove any oscillation of the reference signal. The filter shall be adjustable from 0.01 to 10 seconds. The analog input should be able to be inverted, so that minimum reference corresponds to maximum speed, and maximum reference corresponds to minimum speed. The minimum and maximum values (gain and offset) shall be adjustable within the range of 0 - 20 mA and 0 - 10 Volts. The active analog input shall have loss of reference protection, if selected.
  3. Floating point input shall accept a three-wire input from a Dwyer Photohelic (or equivalent type) instrument.
- R. Serial Communications
1. The AFD shall have an RS-485 port as standard.
  2. The AFD shall be able to communicate with PLC's, DCS's, and DDC's.
  3. Serial communication capabilities shall include, but not be limited to, run-stop control, speed set adjustment, proportional/integral PI controller adjustments, current limit, and accel/decel time adjustments. The drive shall have the capability of allowing the Building Automation System (BAS) to monitor feedback such as output speed/frequency, current (in amps), % torque, % power, kilowatt hours, relay outputs, and diagnostic fault information.
- S. Accessories to be furnished and mounted by the drive manufacturer.
1. Customer Interlock Terminal Strip - provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external interlocks and start/stop contacts shall remain fully functional whether the drive is in Hand, Auto or Bypass.
  2. All wires to be individually numbered at both ends for ease of troubleshooting.
  3. Door interlocked thermal magnetic circuit breaker which will disconnect all input power from the drive and all internally mounted options. The disconnect handle shall be thru-the-door type, and be padlockable in the "Off" position.
  4. Manual transfer to line power via contactors. Include motor thermal overload and fuse or circuit breaker protection while in bypass operation. A three position selector switch to control the bypass contactor and the drive output contactor is to be mounted on the enclosure door. When in the "Normal" mode, the bypass contactor is open and the drive output contactor is closed. In the "Test" position both contactors are open, and in the "Bypass" position, the drive output contactor is open, and the bypass contactor is closed. The drive output contactor shall also open when a stop command is given, isolating the motor from the drive. Start/stop signals and safety interlocks will work in drive and bypass modes.  
Pilot lights shall be provided for indication of "Normal" operation, "Bypass" operation, and "External Fault". All pilot lights shall be push-to-test type.
  5. Service contactor (drive input contactor) which provides the ability to service the drive (electrically isolate the drive while in bypass operation without having to remove power from the motor). The service contactor shall open when the drive is switched to bypass, and also be controlled by a switch which is mounted inside the drive enclosure so that its access is limited to service personnel only.
  6. A class 20 bimetallic thermal motor overload relay shall be provided to protect the motor in bypass.
  7. 3 - 15 PSI pneumatic speed reference shall be via direct connection to the AFD, without the use of external pressure to electrical transducers. A connector outside the AFD enclosure shall be provided for connection of pneumatic tubing.
  8. The AFD shall have a manual speed potentiometer in addition to using the keypad as a means of controlling speed manually.

**PART 3 EXECUTION**

3.01 INSTALLATION

- T. Installation shall be the responsibility of the mechanical contractor. The contractor shall install the drive in accordance with the recommendations of the AFD manufacturer as outlined in the installation manual.
- U. Power wiring shall be completed by the electrical contractor. The contractor shall complete all wiring in accordance with the recommendations of the AFD manufacturer as outlined in the installation manual.

3.02 START-UP

- V. Certified factory start-up shall be provided for each drive by a factory authorized service center. A certified start-up form shall be filled out for each drive with a copy provided to the owner, and a copy kept on file at the manufacturer.

3.03 TRAINING

- A. The manufacturer shall provide on-site training for the owner's maintenance personnel for a period of not less than four (4) hours. Training shall be provided for each different type of drive.

**END OF SECTION**

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**Section 15 995 - Mechanical Commissioning Requirements**

**PART 1 GENERAL**

1.01 COMMISSIONED SYSTEMS

A. Commissioning will be performed on the following systems and equipment:

1. Air-Cooled Chillers
2. Air Handling Units
3. Automatic Control Systems
4. Chilled Water Pumps
5. Terminal Units
6. Electric Heaters
7. Exhaust Fans
8. Ductwork and accessories
9. Piping and accessories
10. Miscellaneous HVAC equipment
11. Fire Protection Systems

1.02 COMMISSIONING RESPONSIBILITIES

- A. The Contractor shall be responsible for, in conjunction with the CxA, scheduling, supervising and coordinating start-up, testing and commissioning activities specified in this section.
- B. The Mechanical Contractor shall review submittal data for conformance with requirements, shall authorize the initial starting of equipment and systems in a manner to avoid damage during construction, shall oversee start-up, testing and balancing and shall document that the requirements of each system have been accomplished.

1.03 COMMISSIONING PHASES

A. Construction Phase:

1. Attend commissioning meetings. These meetings will initially be monthly until functional performance testing begins. The Meetings will than be weekly or as often as necessary.
2. Report in writing to the CxA concerning the status of activities as they affect the commissioning process and the status of deficiencies found during site visits or the performance of functional testing.
3. Provide the CxA with data sheets and submittals for equipment to be commissioned.
4. Provide documentation to the CxA for development of functional performance testing procedures. This documentation shall include manufacturer installation, start-up, operation and maintenance procedures. The CxA may request further documentation as necessary for the development of

functional performance tests.

5. Provide a copy of the O&M manuals and submittals of commissioned equipment to the CxA for review.
  6. Prepare a preliminary schedule for commissioning activities, including pipe and duct system testing, flushing and cleaning, equipment start-up, and TAB. Notify the CxA when commissioning activities not yet performed or scheduled will delay construction.
  7. Execute all mechanical portions of equipment checklists provided by the CxA.
  8. Correct any outstanding noncompliance items before beginning functional performance testing
- B. Acceptance Phase:
1. Place equipment and systems into operation and continue the operation during each working day of the TAB and commissioning activities as required.
  2. Before initiation of TAB ensure all pre-functional checklists of the mechanical systems and associated controls have been completed and reviewed by the CxA.
  3. Provide skilled technicians to operate mechanical and control systems during functional performance testing under the direction of the CxA.
  4. Correct deficiencies as identified by CxA and retest equipment as required.
  5. Prepare O&M manuals in accordance with the Contract Documents.
  6. Provide specified training to Owner's operation personnel.
  7. Maintain marked-up as-built drawing and produce final as-built drawings.
  8. Coordinate with equipment manufacturers to determine requirements to maintain validity of warranty.
- C. Warranty Period:
1. Execute seasonal or deferred functional performance testing, witnessed by the CxA.
  2. Correct deficiencies and make necessary adjustment to O&M manuals and as-built drawings for observations made during seasonal or deferred functional performance testing.

## **PART 2 PRODUCTS**

### **2.01 TEST EQUIPMENT**

- A. Standard test equipment required to perform functional performance testing shall be provided for the equipment or system being tested.

## **PART 3 EXECUTION**

### **3.01 START-UP PLAN AND PRE-FUNCTIONAL TESTING**

- A. Pre-functional testing shall be required for each piece of equipment to ensure that the equipment and systems are properly installed and ready for operation, so that functional performance testing may proceed without delays. Sampling strategies shall not be used for pre-functional testing.
- B. As a minimum the start-up and check-out plan shall consist of the following:

1. The manufacturer's standard start-up and check out procedures copied from the installation manuals. The plan shall include checklists and procedures with specific spaces for recording and documenting the inspection of each procedure and a summary block for deficiencies and explanations.
  2. Equipment Pre-Functional Checklists (to be provided by the CxA)
    - a. Equipment Verification Checklist
      - (1) Ensures mechanical and electrical specifications on equipment match specifications required by construction documents.
      - (2) Contractor shall complete and return to the CxA for review.
    - b. Pre-Installation Checklist
      - (1) Ensures that equipment to be installed is staged properly, free of damage and ready to be installed.
      - (2) Contractor shall complete and return to the CxA for review.
    - c. Physical Installation Checklist
      - (1) Ensures equipment has been installed in accordance with manufacturer's specifications and meets
      - (2) Contractor shall complete and return to the CxA for review.
  - C. Four weeks prior to start-up, schedule equipment and systems start-up and check out and notify the Owner and the CxA in writing. The execution of Pre-Functional checklists, start-up and check out shall be directed and performed by the Contractor. The CxA shall be present for the start-up check out and pre-functional testing of the first unit of each type of equipment to be commissioned.
  - D. Calibration of sensors associated with a particular piece of equipment shall be included as part of the pre-functional testing and included in the appropriate documentation.
  - E. Completed Pre-functional checklists shall be completed and submitted to the CxA for review. Any non-compliance items should be noted on these checklists. The Contractor shall notify the CxA when outstanding items have been corrected.
  - F. Start-up and pre-functional testing must be performed before functional performance testing may proceed.
- 3.02 FUNCTIONAL PERFORMANCE TESTS
- A. Accomplish functional performance testing of equipment as defined by the CxA.
  - B. Functional performance testing is intended to begin upon completion of a system.
  - C. Functional testing may proceed prior to the completion of the system at the discretion of the CxA and the Mechanical Contractor.
- 3.03 DEFERRED TESTING
- A. Seasonal and/or deferred testing shall be accomplished as required.
  - B. These tests shall be executed, documented and deficiencies corrected.

- C. Adjustments or corrections to the O&M manuals and as-built documents required by the results of the testing shall be made prior before the deferred testing is considered complete.

**3.04 SEASONAL ADJUSTMENTS**

- A. Assist the CxA with the seasonal adjustment process. During this effort the CxA will:
  - 1. Check and verify the calibration of temperature control devices and thermostats. Test and verify control sequences for proper operation.
  - 2. Check the operation, performance and balance of air and hydronic systems to provide uniform distribution and comfort conditions.

**3.05 RECORD DRAWINGS**

- A. Upon completion of the project, submit record drawings indicating as-built conditions of plumbing, HVAC, automatic temperature control, fire protection systems, ductwork and equipment, and incorporating changes made during construction.
- B. Record drawings shall, as a minimum, include:
  - 1. Equipment location and orientation
  - 2. Major utility and header locations and sizes
  - 3. Valve and damper locations and types.

**3.06 DIAGRAMS**

- A. Frame and mount the following information:
  - 1. HVAC diagrams, start-stop procedures and valve schedules shall be located in appropriate mechanical rooms.
  - 2. Automatic temperature control diagrams and sequences shall be located adjacent to each control panel.
  - 3. Appropriate control and interface drawings including a simplified guide to local programming through the digital display unit, a directory of I/O points connected to that panel and variables which may be displayed shall be located on the inside cover of each DDC panel.

**3.07 MAINTENANCE DURING CONSTRUCTIONS**

- A. Equipment operated prior to the date of substantial completion shall be maintained in accordance with manufacture's recommendations and turned over to the Owner in a "like new" condition.
- B. Lubricate each item of a system requiring lubrication prior to start-up in accordance with manufacture's recommendations.

**3.08 TRAINING**

- A. Provide Owner's designated personnel with comprehensive training in the understanding of the operation and maintenance of equipment and systems specified in Division 15.
- B. The Mechanical Contractor shall prepare and submit a syllabus describing an overview of the training program; how, when and where the training sessions will occur; names and qualifications of lecturers, and

descriptions of each lecture.

- C. The appropriate trade or manufacturer's representative shall provide the training on each major piece of equipment. Training shall be based and derived from operational and maintenance requirements found in the O&M manual. It is therefore imperative that the O&M manuals be present at each training session.
- D. The training program should include the following, as appropriate:
  - 1. Training will normally start in classroom setting, followed by hands-on training at each piece of equipment. The training shall explain equipment modes of operation, such as start-up and shutdown. The training shall also include instruction on equipment operation during emergency modes, such as fire alarm and loss of power. Maintenance techniques, requirements and troubleshooting techniques shall also be explained in detail.
  - 2. Seasonal changeover, preventative maintenance and special tools and recommended spare parts inventory shall be discussed.
  - 3. Use of the O&M manual shall be discussed.
  - 4. Safety and health issues with each piece of equipment shall be discussed.
  - 5. All warranties and guarantees shall be discussed, including procedures to maintain all warranties and guarantees.
  - 6. Local equipment overrides and operation of equipment not tied into the control system shall be discussed.
- E. The Controls Contractor shall attend training sessions for each type of equipment requiring controls systems to discuss interaction of the control system with the equipment or system being discussed.
- F. Training shall not occur until functional performance testing is complete unless approved by the Owner.

End Of Section



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## SECTION 16 100 - GENERAL PROVISIONS

### PART 1 GENERAL

#### 1.01 GENERAL REQUIREMENTS

- A. Division 1, General Requirements, are hereby made a part of this section as fully as if repeated herein.

#### 1.02 QUALITY ASSURANCE

- A. Building Codes/Laws

All electrical work shall be in accordance with the following:

1. The 2002 edition of the National Electrical Code (NFPA 70).
2. The 2000 edition of the International Building Code.
3. The 2000 edition of the Life Safety Code (NFPA 101).
4. The National Electrical Safety Code (ANSI C-2).
5. Regulations of the local utility company with respect to metering and service entrance.
6. Local city and county ordinances governing electrical work.
7. Americans with Disabilities Act (Public Law 101-336).

#### 1.03 SCOPE

- A. The work to be done under this Section of the Specifications shall include the furnishing of labor, material, equipment and tools required for the complete installation of systems for power, lighting, signals and all other work indicated on the drawings or as specified herein. A 100% operational building, and electrical distribution system up to a connection point for owner furnished equipment will be provided.
- B. A complete system of conduit and wiring for power and lighting from the building utility systems, shall be furnished and installed as indicated on the drawings and/or as described herein.
- C. All materials and appliances, obviously a part of the electrical systems and necessary to its proper operation, but not specifically mentioned or shown on the drawings, shall be furnished and installed without additional charge.
- D. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawing and Specifications, the higher cost shall be included, and the engineer shall be notified of the discrepancy.

#### 1.04 WORK INCLUDED

The Electrical Systems installed and work performed under this Division of the Specifications shall include but not necessarily be limited to the following:

- A. Power Distribution System.
- B. All lighting systems (indoor and outdoor, normal, emergency and exit) including all fixtures, lamps, plaster and/or tile frames, standards, switches, outlets, wiring, dimmers, contactors, time clocks, photocells, raceways and other components and fittings required for complete lighting systems.
- C. Wiring, including power circuit connections for HVAC, plumbing and other mechanical equipment.

- D. Grounding Systems.
- E. Temporary service lighting and power system.
- F. Telephone/data system raceways and equipment mounting boards as indicated on the drawings.
- G. Underground raceway excavation, backfill, and compaction.
- H. Fire Alarm System.
- I. Concrete work for duct banks, manholes, covering, lighting standard bases and equipment bases (where applicable).

1.05 ELECTRICAL BASE BID AND ALTERNATE

- J. The base bid is the work contained in the drawings E1a, E1b, E1c, E2, E3, and E4 and as specified and omitting drawings E1aA, E1bA, E1cA, E2A, E3A, and E4A.
- K. The Alternate bid is the work contained in the drawings E1aA, E1bA, E1cA, E2A, E3A, and E4A and as specified and omitting drawings E1a, E1b, E1c, E2, E3, and E4.

1.06 DEFINITIONS

- A. Terms: The following definitions of terms supplement those of the GENERAL CONDITIONS and are applicable to DIVISION 16 - ELECTRICAL.
  - 1. Provide: As used herein shall mean "furnish, install and connect complete".
  - 2. Wiring: As used herein shall mean "wire or cable, installed in raceway with all required boxes, fittings, connectors, and accessories; completely installed."
  - 3. Work: As used herein shall be understood to mean the materials completely installed, including the labor involved.

1.07 ELECTRICAL DRAWINGS

- A. Drawings are generally diagrammatic and show the arrangement and location of fixtures, equipment and conduit. The Electrical Subcontractor shall carefully investigate the structural and finish conditions affecting his work and arrange his work accordingly. Should conditions on the job make it necessary to rearrange conduit or equipment, the Electrical Subcontractor shall so advise the Engineer and secure approval before proceeding with such work.
- B. Where exact locations are required by equipment for stubbing-up and terminating conduit concealed in floor slabs, the Electrical Subcontractor shall request shop drawings, equipment location drawings, foundation drawings, and any other data required by him to locate the concealed conduit before the floor slab is poured.
- C. Materials, equipment or labor not indicated but which can be reasonably inferred to be necessary for a complete installation shall be provided. Drawings and Specifications do not undertake to indicate every item of material, equipment, or labor required to produce a complete and properly operating installation.
- D. The right is reserved to make reasonable changes in locations of equipment indicated on drawings prior to rough-in without increase in contract cost.
- E. The Contractor shall not reduce the size or number of conduit runs indicated on the drawings without the

written approval of the Engineer.

- F. Locate pull boxes, panelboards, control pushbuttons, terminal cabinets, safety switches and such other apparatus as may require periodic maintenance, operation, or inspection, so that they are easily accessible. If such items are shown on the plans in locations which are found to be inaccessible, the Engineer must be advised of the situation before work is advanced to the point where extra costs will be involved.
- G. All additional circuit connections to panelboards must be preapproved by the Engineer.
- H. Any work installed contrary to Contract Drawings shall be subject to change as directed by the Engineer, and no extra compensation will be allowed for making these changes.
- I. The location of equipment, fixtures, outlets, and similar devices shown on the drawings are approximate only. Do not scale drawings. Obtain layout dimensions for equipment from Architectural plans unless indicated on electrical plans.
- J. Schematic diagrams shown on the drawings indicate the required functions only. Standard circuits of the particular manufacturer may be used to accomplish the functions indicated without exact adherence to the schematic drawings shown. Additional wiring or conduit required for such deviations shall be furnished at Contractor's expense.
- K. Verify the ceiling type, ceiling suspension systems, and clearance above hung ceilings prior to ordering lighting fixtures. Notify the Engineer of any discrepancies.
- L. Review all architectural drawings for door swings, cabinets, counters and built-in equipment.
- M. Portions of these drawings and specifications are abbreviated and may include incomplete sentences. Omissions of words or phrases such as "the Contractor shall", "shall be", "as indicated on the Drawings", "In accordance with", "a", "the" and "all are intended" shall be supplied by inference.

#### 1.08 ON-SITE DRAWINGS

- A. The Electrical Subcontractor shall provide and maintain at the site a set of prints on which shall be accurately shown the actual installation of all work under this section, indicating any variation from contract drawings, including changes in sizes, locations and dimensions. Changes in circuitry shall be clearly and completely indicated as the work progresses.
- B. These progress prints shall be available for inspection by the Owner or any of his representatives and may be used to determine the progress of electrical work.

#### 1.09 SUBMITTALS

- A. Submit for approval, details of all materials, equipment and systems to be furnished. Submission shall consist of four (4) copies (minimum beyond the Electrical Subcontractor's own needs) neatly arranged in three ring binders, containing one (1) copy each of the following:
  - 1. Submit a listing of all the materials indicated below, with the type of material, manufacturer and catalog or model number for each.
    - Multiconductor Cables
    - Wiring Devices and Plates

- Disconnect Switches
  - Time Switches
  - Photocells
  - Lighting Contactors
  - 2. Submit complete shop drawings of the following when supplied by the Electrical Contractor:
    - Fuses and/or Circuit Breakers with characteristic trip curves
    - Switchboards
    - Transformers
    - Panelboards and Cabinets
    - Lighting Fixtures
    - Fire Alarm System
    - Transient Voltage Surge Suppression
  - 3. Submit test reports as required in Section 3.01.
- B. One manufacturer shall be selected for any specific classification of material, equipment or systems. For example, all devices or panelboards, one manufacturer, etc. If more than one manufacturer is submitted, the Engineer shall select one and disapprove the others.
- C. ALL OF THE ABOVE SYSTEMS AND EQUIPMENT SHALL BE SUBMITTED IN NO MORE THAN TWO (2) SUBMISSIONS.
- D. Any materials and equipment listed which are not in accordance with specification requirements may be rejected.
- E. The approval of systems, equipment and shop drawings is a general approval subject to the contract drawings, specifications and verification of all measurements at the job. Approval does not relieve the Electrical Subcontractor from the responsibility of shop drawing errors. The Electrical Subcontractor shall carefully check and correct all shop drawings prior to submission for approval.

#### 1.10 GUARANTEE

- A. The Electrical Subcontractor shall guarantee to make good all defects in material, equipment, or workmanship disclosed within a period of one (1) year from date of building acceptance by the Owner. The phrase "to make good" shall mean to furnish promptly, without charge, all work necessary to remedy the defects to the satisfaction of the Engineer.

#### 1.11 OPERATING AND MAINTENANCE MANUAL

- A. After completion of the work, the Electrical Subcontractor shall furnish and deliver to the Engineer four (4) copies of a complete brochure. Each brochure shall include one (1) copy each of all approved shop drawings, catalog pages, instruction sheets, operating instructions, and spare parts bulletins. A system wiring diagram shall be furnished for each separate system, i.e. fire alarm console, public address system, security system, clock system, etc.

#### 1.12 TEMPORARY LIGHT AND POWER

- A. The Electrical Contractor shall provide a temporary service of the amperage and voltage required by the Project Manager.

- B. Sufficient wiring, outlets and lamps shall be installed to insure proper lighting in accordance with OSHA, state and municipal codes. Refer to Division 1 specifications for requirements.

#### 1.13 EQUIPMENT REQUIRING ELECTRICAL SERVICE

- A. Review all specification sections and drawings including HVAC, plumbing and other equipment drawings and other divisions of the specifications for equipment requiring electrical service. Provide service to and make connections to all such equipment requiring electrical service.
- B. Drawings indicate design loads and voltages and corresponding control equipment and feeders. If equipment actually furnished have loads other than those indicated on the drawings or specified herein, control equipment and feeders shall be adjusted in size accordingly at no additional cost.

#### 1.14 MECHANICAL SYSTEMS COORDINATION

- A. All control wiring for mechanical systems shall be installed under Division 15.
- B. Motor controllers (starters) shall be furnished under Division 15 and installed under Division 16, unless specified otherwise.
- C. Power wiring to all motors and motor controllers and between motors and controllers shall be provided in Division 16.

#### 1.15 SCHEDULING OF POWER OUTAGES

- A. Electrical work requiring interruption of electrical power which would adversely affect the normal operation of the other portions of the Owner's property, shall be done at time other than normal working hours and scheduled in advance with the owner.

#### 1.16 PERMITS

- A. Obtain all permits and inspections for the installation of this work and pay all charges incident thereto. Deliver to the Owner all certificates of said inspection issued by authorities having jurisdiction.

### **PART 2 PRODUCTS**

#### 2.01 SUBSTITUTIONS

- A. Where equipment is identified by manufacturer and catalog number, it shall be as the base of requirements for quality and performance. Where manufacturers for equipment are identified by name, the Electrical Subcontractor may submit for approval, similar equipment of other manufacturers as substitution. The Engineer's decision as to whether the submitted equipment is acceptable shall be final and binding.
- B. All changes necessary to accommodate the substituted equipment shall be made at the Electrical Subcontractor's expense, and shall be as approved by the Engineer. Detailed drawings indicating the required changes shall be submitted for approval at the time the substitution is requested.
- C. If substitutions are made in lieu of fixture specified; form, dimension, design and profile shall be submitted to the Engineer for approval. Full IES photometric test reports for the fixture, lamp(s), and lenses to be substituted for approval.

- D. Submit request for approval of substitute materials in writing to Architect at least ten days prior to bid opening.
- E. Refer to the General Conditions, which governs "Substitution" of specified equipment or materials.

## 2.02 MATERIALS

- A. All materials used in this work shall be new and shall bear the inspection label of Underwriters' Laboratories, Inc.
- B. The published standards and requirements of the National Electrical Manufacturers Association, the American National Standard Institute, the Institute of Electrical and Electronic Engineers, and the American Society of Testing Materials, are made a part of these specifications and shall apply wherever applicable.
- C. Catalog numbers and trade names in these Specifications are noted on the Drawings and intended to describe the materials, devices, or apparatus wanted. Similar materials of other manufacturers, if of equal or equivalent quality, capacity and character, may be substituted in conformity with provisions of the substitutions section of these Specifications.

## 2.03 IDENTIFICATION

- A. Equipment or devices specified in the individual sections to be identified shall be identified by machine cut stencil unless the equipment is identified by the manufacturer. Identification of flush mounted cabinets and panelboards shall be on the inside of the device. Surface mounted equipment shall be identified on the outside cover. Equipment operating on 208Y/120 volt system shall be identified with black labels with white inner core, 480Y/277 volt equipment with red labels with white inner core.

## **PART 3 EXECUTION**

### 3.01 ELECTRICAL TESTING

- A. Furnish all labor, materials, instruments, supplies, and services and bear all costs for the accomplishment of the tests herein specified or requested at job site. Correct all defects appearing under test, and repeat the tests until no defects are disclosed, leave the equipment clean and ready for use.
- B. All grounds, crosses, shorts, etc., must be eliminated from the wiring. Test all lighting fixtures, together with switches and controls; test the operation of all motors, controllers, and other electrical equipment devices.
- C. The switchboard and all feeders shall be Meggar tested. A copy of all test reports shall be given to the Engineer.
- D. The Electrical Subcontractor shall perform any tests other than herein specified which may be required by the Engineer or the authority having jurisdiction.
- E. Perform the following tests after installation but before energizing the equipment. The following tests and procedures apply to all equipment and material that is to be tested under this contract.

1. Transformers.
    - a. Visually inspect all components for damage, check bushings and insulators for cracks; transformer casing for evidence of leakage; pressure, temperature and liquid level gauges for proper indications.
  2. Ground resistance:
    - a. Visually inspect for specified ground connections.
    - b. Perform ground resistance test at all connections to switchboards and panelboards.
    - c. Use three point or fall of potential method.
    - d. Verify single point connection (at the counterpoise) between the grounded and grounding systems.
  3. Switchboards and Panelboards.
    - a. Visually inspect all components for damage.
    - b. Check operation of circuit breakers/fusible switches.
  4. Ground Fault Systems:
    - a. Visually inspect for damage and improper connections.
    - b. Use primary injection method to test for proper operation.
    - c. Adjust for proper rating in accordance with Owner's instructions.
  5. Transfer and Other Relay Schemes:
    - a. Investigate intended function, and verify correct operation.
- F. The Engineer shall be notified immediately of any unfavorable test results or indication of faulty equipment. No piece of equipment shall be energized until the test data is evaluated and the equipment is proven acceptable.
- G. If the test and inspection data submitted should indicate deficiencies in the operation of the electrical apparatus or in the manufacturer thereof, the Contractor shall promptly implement the necessary adjustments, corrections, modifications and/or replacements necessary to meet the specified requirements.

### 3.02 INSTRUCTIONS

- A. The Electrical Subcontractor shall see that the Owner's operating personnel are made entirely familiar with the nature, operation, and maintenance of the system and equipment provided under this Division. Provide video tape instructions for systems requiring training.

### 3.03 CONCRETE WORK

- A. Construct curbs, pads, vaults and similar supports for electrical equipment where required.
- B. Provide 4" thickness housekeeping pads at floor mounted equipment, covering entire area occupied by equipment. Dowel pads to structural slab.
- C. Perform concrete work in accordance with applicable portions of Concrete sections. Minimum compressive strength of concrete shall be same as specified for slabs on grade.

### 3.04 PAINTING

- A. Except as otherwise specified, painting shall be accomplished under Painting Section. Surfaces shall be left clean of debris and free from oil and other substances which would prevent paint bond.
- B. Touch up finishes of factory painted apparatus where finish is marred during installation.

- C. Where galvanizing is broken during fabrication or installation, recoat exposed areas with cold galvanizing compound.
- D. Do not paint over nameplates on equipment, nonferrous hardware, accessories or trim.

### 3.05 MATERIAL HANDLING

- A. Refer to the general requirements section of the Specifications, Division 1, for storage, protection, and handling requirements.
- B. Inspect materials upon arrival at project and verify conformance to Contract Documents. Prevent unloading of unsatisfactory material.
- C. Store packaged materials in original undamaged condition with manufacturer's labels and seals intact.
- D. Handle and store materials in accordance with manufacturer's and supplier's recommendations and in manner to prevent damage to materials during storage and handling. Replace damaged materials.
- E. Containers which are broken, opened, watermarked, or otherwise damaged materials are unacceptable and shall be removed from premises.
- F. 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. Equipment or materials damaged or which are subjected to these elements are unacceptable and shall be removed from the premises and replaced.

### 3.06 OPERATION AND MAINTENANCE MANUALS

- A. Prior to the job completion, provide one (1) set of data on electrical equipment used in the project. Data shall be in bound form and shall include the following items:
  - 1. Shop drawings and product data of all equipment and materials specified to be submitted in the shop drawings section of the Specifications.
  - 2. Panelboard circuit directories reflecting all field changes.
  - 3. Results of all tests performed as specified in the electrical test section of the Specifications.
  - 4. Certificates of inspection from authorities having jurisdiction.

### 3.07 AS-BUILTS

- A. Record Drawings (As-Builts):
  - 1. Provide and keep up to date a complete set of record (as-built) prints, which shall be corrected regularly to show electrical changes from original set of Contract Drawings, including all Addenda, Modifications, Change Orders, field order, job decisions, etc.

### 3.08 EXCAVATION, TRENCHING & BACKFILLING

- A. The contractor shall perform all excavation to install the electrical work herein specified and as indicated on drawings. During excavation, material for backfilling shall be piled back from the banks of the trench to avoid overloading 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 others excavation and any water accumulating therein shall be removed by

pumping. All excavation shall be made by open cut. No tunneling shall be done except under pavement.

- B. The bottom of the trenches shall be graded to provide uniform bearing and support for conduits, cables, or duct bank on undisturbed soil at every point along its entire length. Overdepths shall be backfilled with loose, granular, moist earth, tamped. Remove unstable soil that is not capable of supporting equipment or installation and replace with specified material for a minimum of 12" below invert of equipment or installation.
- C. The trenches shall be backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand and gravel or soft shale, free from large clods of earth and stones, deposited in 6" layers and rammed until the installation has a cover of not less than the adjacent ground but not greater than 2" above existing ground. The backfilling shall be carried on simultaneously on both sides of the trench so that injurious pressures do not occur. The compaction of the filled trench shall be at least equal to 95% of the maximum density as determined by the Standard Proctor Test. Settling the backfill with water will not be permitted. Reopen any trenches not meeting compaction requirements or where settlement occurs, refill, compact, and restore the surface to the grade and compaction indicated, mounded over and smoothed off. A metallic lined underground warning tape shall be provided 12" below finished grade. The tape shall be red for electrical lines and orange for telephone and shall be identified as to the type of line.
- D. Perform excavation and backfilling work in accordance with applicable portions of the earthwork section.

**END OF SECTION**



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## SECTION 16 110 - CONDUIT AND RACEWAYS

### PART 1 GENERAL

#### 1.01 GENERAL REQUIREMENTS

- A. This section covers the complete interior and exterior conduit system.

#### 1.02 QUALITY ASSURANCE

- A. Industry Standards
1. Underwriters' Laboratories, Inc. (U.L.) Publications:
    - No. 1: Flexible Metal Electrical Conduit
    - No. 6: Rigid Galvanized Conduit
    - No. 467: Electrical Grounding and Bonding
    - No. 651: Rigid Nonmetallic Electrical Conduit
    - No. 797: Electrical Metallic Tubing
    - No. 1242: Intermediate Metal Conduit
  2. American National Standards Institute (ANSI):
    - C-80.1: Rigid Galvanized Conduit
    - C-80.3: Electrical Metallic Tubing
- B. Approved Manufacturers:
1. Metallic Conduit Fittings:
    - a. Thomas and Betts
    - b. Appleton
    - c. RACO
    - d. Crouse Hinds
    - e. Steel City
  2. Support Channel:
    - a. Unistrut
    - b. Kindorf
  3. Non-metallic Conduit Fittings:
    - a. Carlon
    - b. Georgia Pipe Company
  4. Rigid, IMC or Flexible Conduit:
    - a. Allied
    - b. Republic
    - c. Triangle
    - d. Wheatland
    - e. Youngstown
  5. Flexible Conduit (PVC Conduit)
    - a. Anaconda "Sealtite"
    - b. Robroy
  6. Electrical Metallic Tubing
    - a. Steeltubes
    - b. National
    - c. Wheatland
    - d. Allied
    - e. Triangle
    - f. Youngstown

7. Plastic PVC
  - a. Carlon
  - b. Georgia Pipe Company

## PART 2 PRODUCTS

### 2.01 CONDUIT FITTINGS

- A. Electrical metallic tubing (EMT) couplings and connectors shall be steel. Malleable iron, pressure cast or die cast fittings are not permitted.
- B. Fittings for 2" conduit and smaller shall be steel set screw type, except where otherwise noted. Fittings for 2.5" conduit and larger shall be steel set screw type with 2 screws for connectors and 4 screws for couplings. All connectors shall be insulated throat type.
- C. Rigid steel and IMC couplings and connectors shall be standard threaded couplings, locknuts, bushings and elbows. All materials shall be steel. Set screw or non-thread fittings are not permitted. Erickson-type couplings may be used to complete a conduit run.

### 2.02 NON-METALLIC CONDUIT AND FITTINGS

- A. Non-metallic conduit shall be heavy wall, Schedule 40 PVC.
- B. Couplings and connectors for non-metallic conduit shall be of the same material and be the product of the same manufacturer of the conduit furnished.

### 2.03 CONDUIT SUPPORT

- A. Individual conduit hangers shall be galvanized spring steel specifically designed for the purpose and sized appropriately for the conduit type and diameter. Support individual conduits 1-1/2 inch and smaller with 1/4 inch threaded steel rods and use 3/8 inch rods for 2 inch and larger.
- B. Conduit support channels shall be 14 gauge galvanized (or equivalent treatment) channel sized for the amount of conduit to be supported. Channel suspension shall be 3/8" threaded steel rods. Attach suspension rods to structure with swivel type connectors. Conduit straps shall be spring steel type compatible with channel.
- C. Conduit straps shall be single hole cast metal type or two hole galvanized metal type. Conduit clamps shall be spring steel type for use with exposed structural steel.

### 2.04 FLEXIBLE CONDUIT AND FITTINGS

- A. Flexible conduit shall be steel metallic type classified for system grounding.
- B. Connectors for flexible conduit shall be insulated throat type rated as suitable for system ground continuity.
- C. Flexible conduit used for other than connections to lighting fixtures shall not be less than 1/2 inch trade size. 3/8 inch flexible conduit may be used for connection to lighting fixtures when sized according to the National Electrical Code.
- D. Flexible conduit used in damp or wet locations shall be liquid tight.

## PART 3 EXECUTION

### 3.01 INSTALLATION

#### A. General

1. Conceal all conduits, except in unfinished spaces such as equipment rooms or as indicated by symbol on the drawings.
2. Leave all empty conduits with a 200 pound test nylon cord pull line.
3. Flattened, dented, or deformed conduits are not permitted and shall be removed and replaced.
4. Fasten conduit support device to structure with wood screws on wood, toggle bolts on hollow masonry, anchors as specified on solid masonry or concrete, and machine bolts, clamps, or spring steel clips, on steel.
5. Protect conduits against dirt, plaster, and foreign debris with conduit plugs. Plugs shall remain in place until all masonry is complete. Protect conduit stub-ups during construction from damage, any damage conduits shall not be used and are to be replaced.
6. All feeder conduits shall be mandreled and swabbed to ensure that they are free of dirt, foreign debris, etc.
7. Install conduit with wiring, including homeruns as indicated on the drawings. Any change resulting in a savings in labor or materials is to be made only in accordance with a contract change. Deviations shall be made only where necessary to avoid interferences and when approved by Engineer by written authorization.
8. Conduits which penetrate roof membranes shall be installed in accordance with manufacturer's recommendations and architectural specifications.
9. Seal all conduits entering building from below grade, all conduits entering refrigerated spaces i.e. freezers and coolers, and all conduits entering exterior mounted electrical equipment with insulating electrical putty to prevent entrance of moisture.
10. Separate raceway systems are to be installed for power systems and for control, signal and communications systems. Do not install control, signal or communications cables in the same raceways as branch circuit or feeders cables, unless indicated otherwise on the drawings.
11. Conduit fittings shall be gland and ring compression type for all conduit exposed to outdoor environments.
12. Conduit shall be run parallel or at right angles to existing walls, ceilings, and structural members.
13. Support branch circuit conduits at intervals not exceeding ten feet and within three feet of each outlet, junction box, fitting, panelboard, enclosure or cabinet. Support conduits from structural steel members with spring steel type or beam conduit clamps and to non-metallic structural members with one hole conduit straps. For exposed conduits and where conduits must be suspended below structure, single conduit runs shall be supported from structure by hanger rod and conduit clamp assembly, and multiple conduits shall be supported by trapeze type support suspended from structure. Do not attach conduits to ceiling suspension system channels or suspension wires.
14. Attach feeder conduits larger than one inch trade diameter to or from structure on intervals not exceeding twelve feet with conduit beam clamps, one hole conduit straps or trapeze type support.
15. Where conduits must pass through structural members obtain approval of Architect.
16. Install all conduits or sleeves penetrating or routed within rated fire walls or fire floors to maintain fire rating of wall or floor. Conduit shall not be installed in rated floors or walls if it compromises or violated the fire rating of floor or wall. Refer to architectural documents.
17. Provide expansion and deflection coupling where conduit passes over a building expansion joint.

#### B. Uses Permitted

1. Conduits installed within concrete floor slabs which are in direct contact with grade or which penetrate the building roof shall be galvanized rigid steel (G.R.S.), intermediate metal conduit (I.M.C.) or

- Schedule 40, heavy wall PVC.
2. Service entrance conduits and feeder conduits in direct contact with earth shall be schedule 40, heavy wall PVC. All service entrance conduit elbows shall be galvanized rigid steel. Service entrance conduits installed exposed or concealed in walls or above ceilings shall be galvanized rigid steel (G.R.S.) or intermediate metal conduit (IMC). Service entrance conduits shall be installed "outside" of the building as defined by the N.E.C. Provide concrete encasement where required or as indicated on drawings.
  3. All other conduit, unless specified herein, not permitted in accordance with the National Electrical Code, or otherwise indicated on the drawings, shall be electrical metallic tubing (EMT). **PVC conduit is not allowed in exposed or concealed areas, but only within concrete or below grade.**
  4. Use flexible conduit for connections to motors, dry type transformers, electrical duct heaters, unit heaters, kitchen equipment, flush mounted lighting fixtures, and any vibrating equipment.
    - a. Flexible conduit used for connection of motors, dry type transformers, electric duct heaters, unit heaters, and bus duct tap devices shall not exceed 36-inches in length.
    - b. Flexible conduit from outlet box to flush mounted lighting fixture shall not exceed 6-feet in length.
    - c. Maintain ground continuity through flexible conduit with green equipment grounding conductor; do not use flexible conduit for ground continuity.
    - d. Liquid tight flexible conduit shall be used to connect equipment in exterior, damp or wet locations [and the kitchen area] [and laundry area] [ and mechanical equipment rooms].
  5. All conduit from the fire pump controller to the fire pump shall be either galvanized rigid steel or liquid tight flexible conduit.
- C. Below Grade Raceway Installations
1. Direct Burial Conduit
    - a. Install top of conduits 24-inches minimum below finished grade or as indicated on drawings.
    - b. Install top of conduits 6 inches minimum below bottom of building slabs.
    - c. Where transition is made from below grade PVC installation to a metallic conduit system above grade or slab, make transition with an "FA" adaptor above slab. Electrical metallic tubing or galvanized steel shall extend from adaptor.
- D. Raceway Installations Within Concrete
1. Conduit shall be run following the most direct route between points.
  2. Conduit shall not be installed in concrete or where the outside diameter is larger than 1/3 of the slab thickness.
  3. Conduits shall not be installed within shear walls unless specifically indicated on the drawings. Conduit shall not be run directly below and parallel with load bearing walls.
  4. Protect each metallic conduit installed in concrete slab or conduits 1-1/2 inch and smaller passing through a concrete slab against corrosion where conduit enters and leaves concrete by wrapping conduit with vinyl all-weather electrical tape.
  5. Protect all conduits entering and leaving concrete floor slabs from physical damage during construction.
  6. Provide expansion fittings in all conduits where length or run exceed 200 feet or where conduits pass through building expansion joints.
  7. Install all conduits penetrating or routed within rated fire floors to maintain the fire rating of the floor. Conduit shall not be installed in rated floors or walls if it compromises or violates the fire rating of floor or wall. Refer to architectural documents.

**END OF SECTION**

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## SECTION 16 120 - CONDUCTORS

### PART 1 GENERAL

#### 1.01 DESCRIPTION

- A. Description of System: Provide a complete system of wiring with all feeders and branches as shown on the Drawings. The wiring system shall be complete to each and every outlet and apparatus shown on the Drawings which requires electrical connections.

#### 1.02 QUALITY ASSURANCE

- A. Acceptable Manufacturers: Wire shall be Southwire, Pirelli, Rome, General Cable, Senator, or United Copper Industries.
- B. Standards: Specified conductor gauge sizes refer to American Wire Gauge.

#### 1.03 COLOR CODING

- A. Color coding shall be as follows:
- | <u>120/208 Volt System</u>  | <u>277/480 Volt System</u> |
|---|----------------------------|
| Phase A - Black   | Phase A - Brown            |
| Phase B - Red   | Phase B - Orange           |
| Phase C - Blue  | Phase C - Yellow           |
| Neutral - White   | Neutral - Gray             |
| Ground - Green  | Ground - Green             |
| Isolated Ground - Green<br>with yellow stripe (where applicable)<br>(Verify color coding with local code Authority and use local code requirements if and only if the above color code is not acceptable to local authority.) |                            |
- B. All wire shall be color coded to indicate the various phase and neutral. Approved 3/4" wide tape bands, corresponding to Color code, N.E.C. Section 210-5, and as specified hereinbefore, shall be provided for cables #6 AWG and larger within 6" of each conductor termination. Wiring #8 AWG or smaller shall have color coded jacket throughout its entire length.

### PART 2 PRODUCTS

#### 2.01 CONDUCTORS

- A. Conductor Material: Conductors shall be copper, 98.5% conductivity except where specifically noted otherwise on Drawings.
- B. All wire and cable shall have copper conductors and shall be 600 volts, 90 degree C., NEC type conductors. No. 4 AWG and smaller shall have THHN, THWN-2 insulation, larger conductors shall have "XHHW-2" of minimum 45 mil thickness.
- C. Wire No. 8 AWG and larger shall have stranded conductors. Wire No. 10 AWG and smaller shall be solid conductor type.

- D. No wire shall be smaller than No. 12 AWG unless otherwise specified or noted.
- E. Branch circuit wiring which supplies more than one fluorescent fixture through the wiring of other fixtures shall be high temperature wire approved for such use.
- F. Nonmetallic-sheathed cable (Romex) shall be permitted in one-, two- and multi-family dwellings not exceeding three floors above grade, where permitted by local authority.

## 2.02 ALUMINUM CONDUCTORS

- A. The contractor shall provide alternate pricing for the use of aluminum alloy conductors for copper feeders sizes #4/0 AWG and larger indicated on the plans.
- B. Aluminum conductors shall be equal ampacity and must be scheduled in wiring and **submitted to the engineer of record for approval prior to installation.**
- C. Aluminum conductors shall be compact, Alcan or Southwire Type XHHW-2 (90E C). Conductors shall be AA-8000 series.
- D. Aluminum conductors shall not be installed to any vibrating equipment (e.g. mechanical equipment, transformers, etc).
- E. Mechanical screw-type connectors shall comply with the following:
  - 1. Connectors shall be dual rated (AL7CU or AL9CU) and listed by UL for use with aluminum and copper conductors and sized to accept aluminum conductors of the ampacity specified.
  - 2. Using a suitable stripping tool, to avoid damage to the conductors, remove insulation from the required length of the conductor.
  - 3. Wire brush the conductor and apply a Listed joint compound.
  - 4. Tighten the connection per the connector manufacturer's recommendation.
  - 5. Wipe off any excess joint compound.
- F. For connection to aluminum bus, the following hardware shall be used:
  - 1. Bolts: Anodized alloy 2024-T4 and conforming to ANSI B18.2.1 and to ASTM B211 or B221 chemical and mechanical property limits.
  - 2. Nuts: Aluminum alloy 6061-T6 or 6262-T9 and conforming to ANSI B18.2.2.
  - 3. Washers: Flat aluminum alloy 2024-T4, Type A plain, standard wide series conforming to ANSI B27.2.
  - 4. Lubricate and tighten the hardware as per the manufacturer's recommendations.
- G. For connection to copper bus, the following hardware shall be used:
  - 1. Bolts: Plated or galvanized medium carbon steel; heat treated, quenched and tempered equal to ASTM A-325 or SAE grade 5.
  - 2. Nuts: Heavy semi-finished hexagon, conforming to ANSI B18.2.2, threads to be unified coarse series (UNC), class 2B.
  - 3. Washers: Should be steel, Type A plain standard wide series conforming to ANSI B27.2.
  - 4. Belleville conical spring washers: shall be of hardened steel, cadmium plated or silicone bronze.
  - 5. Lubricate and tighten the hardware as per the manufacturer's recommendations.
- H. Aluminum conductors shall not be used where expressly forbidden by the local electrical inspections department or plan review board of jurisdiction. Electrical contractor shall verify this requirement prior to bid. Substitute equal ampacity copper conductors as required.

- I. Aluminum conductors shall not be used to equipment which is not U.L. listed for aluminum (e.g. fire pumps, elevators).
- J. Service entrance cable, Type SE (XHHW), Style SER, 600 volt, aluminum alloy shall be permitted as unit panel feeder in multifamily dwellings.

#### 2.03 METAL CLAD "MC" CABLE

- A. Where allowed by the authority having jurisdiction, the use of metal clad cable shall meet all the requirements of the following codes and standards.
  - 1. Underwriter's Laboratory 83, 1479, 1569, and 1581.
  - 2. National Fire Protection Association NFPA 70, Article 334.
  - 3. All local codes and municipal ordinances.
- B. The conductors of the metal clad cable shall comply with Articles 1.03 and 2.01 of this same section.
- C. Metal clad cable may not be run directly into surface-mounted panels, cabinets, switches or other devices. All circuit homeruns shall be installed in conduit and shall be routed from the panelboard to the first branch circuit device.
- D. Unless noted otherwise, the metal clad cable shall be **MC** using a galvanized steel jacket (blue strip), solid copper conductors, a Mylar assembly covering tape, rated at 90 degrees centigrade, with a green insulated grounding conductor and rated for a maximum of 600 volts.
- E. Refer to National Electrical Code Article 330.12 for uses not permitted.
- F. Cables installed in other than vertical runs through bored or punched holes in wood or metal framing members, or through notches in wooden framing members and protected by a steel plate at least 1/16 inch thick, shall be considered supported and secured where such support does not exceed six (6) feet intervals.
- G. Cables containing four or fewer conductors sized not larger than #10 AWG shall be secured within 12 inches of every box, cabinet, fitting or other cable termination.
- H. Metal clad cable shall not be installed outside the building without written authorization from the engineer.
- I. It is mandatory to use an anti-short bushing at all terminations.
- J. The jacket of the cable assembly shall convey the type and number of conductors using a color coding system.
- K. Acceptable manufacturer(s): AFC.

#### 2.04 ACCESSORIES

- A. Wire Joints: T & B "Sta-Kon", Scotchlok Type "R", Ideal No. 452 or 453, or Buchanan "B-Cap".
- B. Cable Connectors: Solderless Type O.Z. "circular clamp type" or T & B "lock-tite" appropriate for the particular application involved.
- C. All field terminations shall be treated with Copper Shield gasket paint or equal. All connectors shall be the

long barrel, three crimp type.

### **PART 3 EXECUTION**

#### **3.01 PREPARATION**

- A. Lubricant: No grease, oil or lubricant other than powdered soapstone or approved pulling compound, shall be used to facilitate the pulling of wires.
- B. Raceway: Raceways shall be free of concrete, moisture, or other foreign matter. Raceways shall be swabbed as necessary before pulling wire.

#### **3.02 INSTALLATION**

- A. Complete electrical systems shall be provided as shown on the Drawings and/or as specified herein.
- B. Wires shall be pulled without excessive strain to prevent damage to conductor or insulation. Provide pull boxes as required to facilitate pulling of wire.
- C. Each raceway indicated by symbol on Drawings shall contain three (3) No. 12 AWG wires unless otherwise noted, scheduled or indicated. Hatch marks on raceway symbols indicate the number of conductors in a raceway when the number exceeds three (3).
- D. Cable pulling compound shall be used. (Ideal, Wire-Ease, or approved equal).
- E. At each fixture or device outlet, a loop or end of wire not less than 8" long shall be left for connection to fixture or device.
- F. Wire in capped outlets shall have ends taped.
- G. Splices, taps and connections shall be made up as follows:
  - 1. Wire sizes No. 8 AWG and smaller with mechanical connectors.
  - 2. Wire and cable of sizes No. 6 AWG and larger, with mechanical or indent connectors.
- H. Joints shall be covered with 7 mil thick electrical tape on branch circuit wiring connections, and 10 mil thick electrical tape on mechanical and indent connectors on larger cables.

**END OF SECTION**

## SECTION 16 130 - OUTLET BOXES AND JUNCTION BOXES

### PART 1 GENERAL

#### 1.01 DESCRIPTION

- A. Description of System: Standard boxes shall be provided at all outlets for lights, switches, receptacles, etc.

#### 1.02 QUALITY ASSURANCE

- A. Acceptable Manufacturers: National Electric Products Company, Steel City Electric Co., Appleton or Raco.
- A. Acceptable Manufacturers: Carlon, Thomas & Betts, Pass & Seymour or equal.

#### 1.03 JOB CONDITIONS

- A. Protection: Anchor boxes securely to formwork. Provide necessary protection to prevent entry of concrete.
- B. Sequencing, Scheduling: Locations of outlets shown on the Drawings are relative and approximate. Exact locations shall be determined on the job and the outlets accurately set according to the Architectural Drawings, dimensions, casework kneespace, building conditions, furniture positions and Architect's direction. The right is reserved to change the exact location (10'-0" or less) of any switch, ceiling outlet or other outlet in any room before it is permanently installed without increase in Contract cost.
- C. All outlet boxes and junction boxes shall be accessible. Any boxes in nonaccessible areas (furred ceilings) shall be set flush with barrier surface at a location approved by the Architect.

### PART 2 PRODUCTS

#### 2.01 OUTLET BOXES

- A. Standard Outlet Boxes: Boxes and covers shall be galvanized steel not less than 1/16" thick and in every instance, of such form and dimensions as to be adapted to its specific use and location, kind of fixtures to be used and number, size and arrangement of conduits connecting thereto and particularly sized to accommodate the number and size of wires to be contained therein.
- B. Ceiling outlet boxes shall be 1-1/2" or 2-1/2" deep, 4" octagonal (or 4" square when required due to number of wires). Plaster rings or device covers need not be provided on ceiling boxes. Provide extension rings on ceiling boxes to accommodate number of conductors in box.
- C. Wall outlet boxes for toggle switches and convenience outlets shall be 1-1/2" or 2-1/8" deep, 4" square. Provide with single device covers (or two-device covers where needed). Covers shall be raised type to compensate for thickness of plaster or gypsum board wall finish.
- D. Outlet boxes for telecommunication purposes (telephone, data, etc.) shall be 4" x 4" square, 2-1/8" deep. Provide with single device covers (or two-device covers where needed). Covers shall be raised type to compensate for thickness of plaster or gypsum board wall finish.

- E. Junction boxes shall be as specified for ceiling and wall outlet boxes. Provide flat covers on ceiling outlets to match ceiling finish. Provide blank device type coverplates on wall outlets, of same materials as specified for device coverplates in same room or area.
- F. Outlet boxes where exposed rigid conduit is used shall be cast ferrous alloy, galvanized.
- G. Covers: Where outlet boxes are to be capped, blank coverplates shall be used.

### **PART 3 EXECUTION**

#### **3.01 INSPECTION**

- A. The location of all wall outlets, including light fixtures, receptacles, switches, etc., shall be checked to see that the outlet will clear any wall fixture, shelving, work tables, sinks, baseboard and fin type convectors, bulletin boards, etc., that will be installed.
- B. Exact locations of outlet boxes shall be coordinated with other trades so that outlet will not be covered by ductwork, piping, etc.
- C. The approximate locations of outlets are indicated on the Drawings. The exact locations shall be determined at the building. The right is reserved to change, without additional cost, the exact location of any outlet, a maximum of 10' before it is permanently installed.

#### **3.02 PREPARATION**

- A. Architectural Placement: Outlets occurring in Architectural features shall be accurately centered in same. Space wall switch outlets equidistant from door trims on the strike side of doors as actually installed so that coverplate clears trim. Orientation of outlet boxes (horizontal or vertical) shall be as indicated on architectural elevations.
- B. Install all outlet boxes in finished areas flush with wall or ceiling finish. Maintain 1/4" or less space between outlet box front and finish wall surface.
- C. All switches at same level shall be installed on one horizontal line as shown on the Drawings.
- D. Wall mounted controls, including temperature controls, in a room shall be grouped at the same location and at same mounting heights.

#### **3.03 INSTALLATION**

- A. At all concealed outlets for electric lights, switches, wall receptacles, etc., plaster rings shall be provided.
- B. Outlet boxes shall be firmly anchored in place and shall be provided with approved fixture studs where required. Outlet boxes shall not depend on the coverplate to hold it secure to the wall.
- C. Outlet boxes installed back-to-back in fire-rated walls shall be separated horizontally by a minimum of 24".

- D. Where necessary, U.L. approved fire rating materials shall be used to provide a complete fire rated assembly.
  
- E. In all cases, non-metallic outlet boxes shall be U.L. listed and labeled to maintain the integrity of all fire rated assemblies. Non-metallic outlet boxes shall be installed in these assemblies based on the U.L. testing data provided by the manufacturer.

**END OF SECTION**



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## SECTION 16 140 - WIRING DEVICES

### PART 1 GENERAL

#### 1.01 GENERAL REQUIREMENTS

- A. Division 1, General Requirements, are hereby made a part of this section as fully as if repeated herein.

#### 1.02 QUALITY ASSURANCE

- A. Acceptable manufacturers: Wiring devices and cover plates shall be Hubbell, Leviton, Eagle and Pass & Seymour.
- B. Wiring devices shall comply with applicable sections of NEMA Standard WD-1.
- C. All special purpose receptacles shall be NEMA standard configuration.
- D. Comparative devices by acceptable manufacturers are equal.

### PART 2 PRODUCTS

#### 2.01 WIRING DEVICE DESCRIPTION AND MANUFACTURER

- A. Single & Duplex Receptacles (20 Amp):
1. Single or duplex type receptacle as indicated. 125V/20A/2P/3W/G rating - NEMA - 5-20R type with urea or nylon body.
  2. Face color shall be gray (red where on emergency circuit).
  3. Manufacturer:
    - a. Hubbell CR5362
- B. GFCI Duplex Receptacles:
1. Duplex, feed-thru type ground fault current interrupter receptacle with test/reset buttons, urea or nylon body. 125V/20A/2P/3W/G rating - NEMA 5-20R type conforming to UL #498, UL #943 Class A and NEMA #WD1-4.02.
  2. Face color shall be gray (red where on emergency circuit).
  3. Manufacturer:
    - a. Hubbell GF5352
- C. Isolated Ground Single & Duplex Receptacles:
1. Single or duplex type receptacles as indicated. 125V/20A/2P/3W/IG rating - NEMA 5-20R type with urea or nylon body and ground internally isolated from receptacle frame and ground pigtail or terminal screw.
  2. Manufacturer:
    - a. Hubbell CR5352 IG
- D. Clock Hanger Receptacles:
1. Single type receptacle with a recessed outlet clock hanger type mounting coverplate. 125V/15A/2P/3W/G - NEMA 5-15R type. Brown colored receptacle face with brass mounting coverplate.
  2. Manufacturer:

- a. Hubbell 5236 Series
- E. TVSS Receptacles:
  - 1. Duplex receptacle shall be 125V/20A and shall be blue in color. Receptacle shall be in compliance with U.L. 1449 Second Edition.
  - 2. Manufacturer:
    - a. Hubbell HBL5362S
- F. Maintained Contact Switches:
  - 1. Provide toggle operated switches SPST, DPST, 3-way or 4-way operation as indicated. 277V/20A rating, quiet type, maintained contact, urea or nylon body add a green hexagonal ground screw or ground pigtail, and side wired.
  - 2. Manufacturer:
    - a. Hubbell CS1221 Series (Color to match receptacles).
- G. Momentary Contact Switches:
  - 1. Provide toggle or key operated switches as indicated with single circuit, 3-position center-off operation. 277V/20A rating, quiet type, momentary contact, spring loaded switch, urea or nylon body and green hexagonal ground screw or ground pigtail, back and side wired.
  - 2. Manufacturer:
    - a. Hubbell HBL 155\* (Color to match receptacle).
- H. Illuminated Toggle Switches:
  - 1. Single pole, 3-way or 4-way, as indicated, conforming to UL #20, NEMA #WDI-3.02 and F.S. #W-S-896E. 277V/20A rating, quiet type, maintained contact, urea or nylon body and a green hexagonal ground screw or ground pigtail, back and side wired. Red colored toggle to glow when switch is on.
  - 2. Manufacturer:
    - a. Hubbell HBL 1221PL
- I. Slider Type Incandescent Dimmers:
  - 1. Slide operated AC incandescent solid state type dimmer with positive ON/OFF switching, integral surge protection, voltage stabilized output, RFI filtered and maximum lighting level adjustment. 120V/60Hz, unless noted otherwise, with lettering and/or nameplate as indicated.
  - 2. Manufacturer:
    - a. Leviton - Monet Series
    - b. Lutron - Nova/Nova T Series (wattage permitting)

## 2.02 COVERPLATE DESCRIPTION AND MANUFACTURER - COVERPLATES

- A. Flush Mounted Interior Receptacle/Switch Coverplates:
  - 1. Single or multi-gang to match device type. Medium size (4-7/8" min.), standard depth, smooth finish with nylon material.
  - 2. Color to match device color.
  - 3. Coverplates in mechanical/electrical equipment rooms and high abuse areas shall be stainless steel, non-magnetic.
  - 4. Manufacturer:
    - a. Hubbell - PJ Series (nylon)
    - b. Hubbell - 302 Series (stainless steel)
- B. Weatherproof Device Coverplates:
  - 1. Provide weatherproof "in use" cast aluminum lockable covers.

- a. Hubbell - WP Series
- C. Multi-Outlet Raceway:
  - 1. Product Description:
    - a. Two-piece rectangular surface raceway of length as prescribed. Stainless steel type 304 housing complete with all bends, fittings, couplings, caps and mounting hardware.
    - b. Single 15A/125V grounding outlets UL labeled and full length ground wire.
    - c. Outlets 18" on centers starting no less than 9" from end.
    - d. Maximum of six outlets per circuit. Where two or more circuits are utilized the outlets shall be on alternate circuits.
  - 2. Manufacturers:
    - a. Wiremold Products
    - b. Walker-Walkermold

### 2.03 MISCELLANEOUS ITEMS

- A. Time Switches:
  - 1. Electronic Astronomical Schedule Type:
    - a. 365 day scheduling, solid state, skip-a-day feature, daylight saving changeover, leap year adjusted with capacitor backup, DPDT-120V/20A rated contacts, light sensor input.
    - b. Acceptable Manufacturer:
      - (1) Paragon #EL72 Series.
- B. Photoelectric Control Switches:
  - 1. Product Description:
    - a. Raintight photoelectric self-contained control for switching.
    - b. Die-cast housing with adjustable sensor.
  - 2. Manufacturers:
    - a. AMF/Paragon
    - b. Tork 2100 Series
- C. Lighting Contactor:
  - 1. Product Description:
    - a. Multi-pole contactor for switching branch circuit tungsten and ballast lighting and resistant heating loads.
    - b. Number of poles as indicated (paralleling multiple contactors is acceptable), poles rated for 20 amperes @ 600V continuous duty.
    - c. Mechanically held contactor with coil clearing contacts, operating coil voltage to match circuit characteristics.
    - d. Housed in panelboard (if indicated).
  - 2. Designated Manufacturers:
    - a. ASCO 917 Series
    - b. Square D Class 8903 Type LL Series
- D. Floor Boxes:
  - 1. Product Description:
    - a. Floor boxes for receptacles and telephone/data outlets shall be rectangular, non-metallic PVC. Boxes shall be suitable for use in slab-on-grade or above grade. Boxes shall include a non-metallic concrete cover to prohibit concrete or debris from entering the box during installation.
    - b. Provide number of compartments as indicated on drawings.
    - c. Coverplates and flanges shall be brass.
  - 2. Manufacturer:

- a. Hubbell PFBRG Series
- b. Walker 880MP

E. Poke-thru Devices:

1. Product Description:

- a. Device shall be one-piece, flush, fire-rated with all-brass fitting and flange. Device shall consist of one (1) duplex receptacle and two(2) Category 5 tele/data jacks.
- b. Device shall require 3" cored hole.

2. Manufacturer:

- a. Hubbell PT4XBRS2C
- b. Walker RC700

**PART 3 EXECUTION**

3.01 INSTALLATION

- A. All dimmer circuits shall have dedicated neutrals.
- B. Install decorative plates on switch, receptacle, and blank outlets when indicated.
- C. Install devices and wall plates flush and level.
- D. Coordinate the exact location of wiring devices with other trades and architectural features. Do not locate devices on two different architectural finishes such as half on wall tile and half on painted surface, unless noted otherwise.
- E. Mount all wiring devices in standard steel outlet boxes. Provide plaster rings in areas requiring them due to construction.
- F. Where more than one device is indicated, arrange in gangs covered with one coverplate.
- G. Provide 8" long ground wire from grounding lug to all switches and receptacles to a screw type bonding device on the conduit or outlet box.

**END OF SECTION**

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## SECTION 16 160 - PANELBOARDS

### PART 1 GENERAL

#### 1.01 DESCRIPTION

- A. Provide the panelboards indicated on the Drawings complete with circuit breakers and spaces.

#### 1.02 QUALITY ASSURANCE

- A. Panels and branch breakers shall be Siemens, Square D, Cutler Hammer or General Electric.
- B. Panels shall be factory assembled.
- C. Coordination: Coordinate installation with architectural and structural features, equipment installed under other sections of the Specifications and electrical equipment to insure panel access and so that clearance minimums are provided.

#### 1.03 SUBMITTALS

- A. Refer to Section 16100, "Electrical General", for submittal requirements.
- B. Manufacturers Product Data:
  - 1. Submit material Specifications and installation data for products specified under Part 2 - Products to include:
    - a. Circuit Breakers
    - b. Panelboards
- C. Shop Drawings: Submit shop drawings to indicate information not fully described by the product data to indicate compliance with the contract drawings.
  - 1. Include electrical characteristics and ratings for each panelboard with dimensions, mounting, bus material, voltage, ampere rating, mains, poles and wire connection, and any accessories. Indicate method of ground bus attachment to enclosure.
  - 2. Include bussing diagram indicating each bussing circuit breaker position.
  - 3. Provide a schedule indicating circuit breaker type, trip and size, poles, frame type, interrupting capacity.

### PART 2 PRODUCTS

#### 2.01 GENERAL REQUIREMENTS

- A. Furnish all materials specified herein.
- B. All panels and circuit breakers shall be U.L. listed and bear a U.L. label. Where panel serves as service entrance equipment, panel shall bear a U.L. label indicating suitability as service entrance equipment.
- C. Panels shall be of the dead front safety type.
- D. Provide panels complete with factory assembled circuit breakers connected to the bus bars in the positions shown on the panel schedules.

**2.02 BUSSING AND INTERIORS**

- A. All bus bars shall be copper. Main lugs and main breakers shall be U.L. approved for copper or aluminum conductors and shall be of a size range for the conductors indicated on the drawings. Each panel shall contain a full size grounding bus. Each lighting and appliance panelboard shall contain a full size insulated neutral bus. Where a distribution type panelboard is indicated on the drawings to have a neutral bus, the bus shall be insulated and full size, unless otherwise indicated on the drawings.
- B. The neutral and ground bus shall have a sufficient number of lugs to singularly terminate each individual conductor requiring a connection.
- C. Where designated on panel schedule as "space", include all necessary bussing, device support and connections. Provide blank cover for each space.
- D. Where specified or indicated on the drawings, provide sub-feed lugs adjacent to the mains or feed-through lugs opposite end of mains and increase box heights to provide additional cable bending and termination space. Lugs to be the same size and capacity as mains and rated for aluminum or copper conductor terminations.

**2.03 ENCLOSURES**

- A. Panelboard width shall not be less than twenty inches unless indicated on the drawings. Panelboard depth shall not exceed 5-3/4 inches. Maximum enclosure width shall be twenty-two inches for panelboards less than 400 amp, thirty inches for 600 amp and less.
- B. Provide concealed captive clamping devices, concealed hinges and chrome lock for all flush mounted panels. Key all panels throughout project alike.
- C. Where two section panels are required, both sections shall have fully rated bus, separate cabinets connected by conduit nipples. Interconnect sections with copper conductors with ampacity equal to rating of main bus. Route phase and neutral conductors together between panels. Provide separate trims for each section.
- D. Provide a directory card and transparent cover permanently mounted on inside of doors.
- E. Panelboard trims for surface mounted panelboards shall be continuously hinged on one side so that when opened, wiring gutters are completely exposed.

**2.04 CIRCUIT BREAKERS**

- A. Interrupting rating of all circuit breakers in panelboards shall have U.L. rating of not less than the RMS symmetrical amps indicated on the drawings at system voltage. Series rated devices are acceptable.
- B. Circuit breakers shall be provided with trip rating and poles as indicated on the drawings or specified herein.
- C. Multi-pole breakers shall be common trip and common reset; tie handle connection between single pole breakers is not acceptable.
- D. Branch circuit breakers in lighting and appliance panels shall be quick-make, quick-break, thermal

magnetic type bolted to the bus. Circuit breakers in distribution type panel boards shall be bolted to the bus.

- E. Provide the following special devices and accessories when indicated on the drawings or specified herein.
  - 1. Ground fault interrupting circuit breakers (GFI) where indicated on the drawings.
  - 2. Provide handle lock-off device to prevent manually turning off device without removal. Install on all circuit breakers [indicated on the panel schedule] [serving exit lighting, egress lighting, fire alarm system, security system].
  - 3. Provide U.L. listed "SWD" switching duty circuit breakers on the devices indicated on the drawings.
  - 4. Provide shunt trip device for electrically tripping circuit breakers indicated on the drawings.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Unless otherwise indicated on the Drawings, provide from each flush mounted panel, four (4) 3/4" empty conduits stubbed out above ceiling line and capped.
- B. Mount panelboards with top circuit breaker not more than 6'-6" above finished floor.
- C. Lace and group conductors installed in panels with nylon tie straps. Only one conductor installed under terminal of individual circuit breakers. Form and train conductors in panel enclosure neatly parallel and at right angles to sides of box. Uninsulated conductor shall not extend beyond one-eighth inch from terminal lug.
- D. Do not splice conductors in panels. Where required, install junction box adjacent to panel and splice or tap conductors in box.
- E. Mounting and Support:
  - 1. Mounting:
    - a. Enclosure shall be secured to structure by a minimum of four (4) fastening devices. Panelboards 600 amp and larger shall be secured by a minimum of eight (8) devices. A 1.5 inch minimum diameter round washer shall be used between head of screw or bolt and enclosure.
    - b. Enclosures shall be mounted where indicated on the drawings or specified herein. Support from the structure with fastening device specified.
    - c. Attach enclosure directly to masonry, concrete, or wood surfaces.
    - d. Mounted enclosure on metal channel (strut), which is connected to structure with fastening device specified, for installation on steel structure or sheet rock walls.
- F. Maintain conductor phase color code requirements described in the conductors and cables section of the specifications.
- G. Provide in each panelboard a typewritten circuit directory mounted under clear plastic in metal directory frame on interior or panel door. Directory shall reflect any field changes or additions.

**END OF SECTION**



## SECTION 16 165 - MAIN DISTRIBUTION PANELBOARDS

### PART 1 GENERAL

#### 1.01 DESCRIPTION

- A. Provide the distribution panelboards indicated on the Drawings complete with circuit breakers and spaces.

#### 1.02 QUALITY ASSURANCE

- A. Distribution panels and branch breakers shall be Siemens, General Electric, Square D, Cutler Hammer.
- B. Distribution panels shall be factory assembled.
- C. Coordination: Coordinate installation with architectural and structural features, equipment installed under other sections of the Specifications and electrical equipment to insure panel access and so that clearance minimums are provided.

#### 1.03 SUBMITTALS

- A. Refer to Section 16000, "Electrical General", for submittal requirements.
- B. Manufacturers Product Data:
  - 1. Submit material Specifications and installation data for products specified under Part 2 - Products to include:
    - a. Circuit Breakers
    - b. Distribution Panelboards
- C. Shop Drawings: Submit shop drawings to indicate information not fully described by the product data to indicate compliance with the contract drawings.
  - 1. Include electrical characteristics and ratings for each distribution panelboard with dimensions, mounting, bus material, voltage, ampere rating, mains, poles and wire connection, and any accessories. Indicate method of ground bus attachment to enclosure.
  - 2. Include bussing diagram indicating each bussing circuit breaker position.
  - 3. Provide a schedule indicating circuit breaker type, trip and size, poles, frame type, interrupting capacity.

### PART 2 PRODUCTS

#### 2.01 GENERAL REQUIREMENTS

- A. Furnish all materials specified herein.
- B. All distribution panels and circuit breakers shall be U.L. listed and bear a U.L. label. Where a distribution panel serves as service entrance equipment, the distribution panel shall bear a U.L. label indicating suitability as service entrance equipment.
- C. Panels shall be of the dead front safety type.
- D. Provide panels complete with factory assembled circuit breakers connected to the bus bars in the positions shown on the panel schedules.

## 2.02 BUSSING AND INTERIORS

- A. All bus bars shall be copper. Main lugs and main breakers shall be U.L. approved for copper or aluminum conductors and shall be of a size range for the conductors indicated on the drawings. Each panel shall contain a full size grounding bus. Each lighting and appliance panelboard shall contain a full size insulated neutral bus. Where a distribution type panelboard is indicated on the drawings to have a neutral bus, the bus shall be insulated and full size, unless otherwise indicated on the drawings.
- B. The neutral and ground bus shall have a sufficient number of lugs to singularly terminate each individual conductor requiring a connection.
- C. The ground bus shall be factory brazed, riveted or installed on studs welded to the panel enclosure. The ground bus shall not be attached to the panel interior.
- D. Where designated on panel schedule as "space", include all necessary bussing, device support and connections. Provide blank cover for each space.
- E. Where specified or indicated on the drawings, provide sub-feed lugs adjacent to the mains or feed-through lugs opposite end of mains and increase box heights to provide additional cable bending and termination space. Lugs to be the same size and capacity as mains and rated for aluminum or copper conductor terminations.

## 2.03 ENCLOSURES

- A. Distribution panelboard width shall not be less than 32 inches and the depth shall not exceed 11 inches.
- B. Provide concealed captive clamping devices, concealed hinges and chrome lock for all flush mounted panels. Key all panels throughout project alike.
- C. Where two section distribution panels are required, both sections shall have fully rated bus, separate cabinets connected by conduit nipples. Interconnect sections with copper conductors with ampacity equal to rating of main bus. Route phase and neutral conductors together between panels. Provide separate trims for each section.
- D. Provide a label for each branch circuit breaker and main circuit breaker as per Section 16100, Paragraph 2.03 permanently mounted.

## 2.04 CIRCUIT BREAKERS

- A. Interrupting rating of all circuit breakers in panelboards shall have U.L. rating of not less than the RMS symmetrical amps indicated on the drawings at system voltage.
- B. Circuit breakers shall be provided with trip rating and poles as indicated on the drawings or specified herein.
- C. Multi-pole breakers shall be common trip and common reset; tie handle connection between single pole breakers is not acceptable.
- D. Circuit breakers in distribution panelboards shall be bolted to the bus.
- E. Provide the following special devices and accessories when indicated on the drawings or specified herein.
  - 1. Ground fault interrupting circuit breakers (GFI) where indicated on the drawings.

2. Provide handle lock-off device to prevent manually turning off device without removal. Install on all circuit breakers indicated on the panel schedule.
3. Provide shunt trip device for electrically tripping circuit breakers indicated on the drawings.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Mount distribution panelboards with top circuit breaker not more than 6'-6" above finished floor.
- B. Lace and group conductors installed in panels with nylon tie straps. Only one conductor installed under terminal of individual circuit breakers. Form and train conductors in panel enclosure neatly parallel and at right angles to sides of box. Uninsulated conductor shall not extend beyond one-eighths inch from terminal lug.
- C. Mounting and Support:
  1. Mounting:
    - a. Enclosure shall be secured to structure by a minimum of eight (8) fastening devices. A 1.5 inch minimum diameter round washer shall be used between head of screw or bolt and enclosure.
    - b. Enclosures shall be mounted where indicated on the drawings or specified herein. Support from the structure with fastening device specified.
    - c. Attach enclosure directly to masonry, concrete, or wood surfaces.
    - d. Mounted enclosure on metal channel (strut), which is connected to structure with fastening device specified, for installation on steel structure or sheet rock walls.
- D. Maintain conductor phase color code requirements described in the conductors and cables section of the specifications.

**END OF SECTION**



## SECTION 16 170 - DISCONNECT SWITCHES

### PART 1 GENERAL

#### 1.01 GENERAL

- A. Furnish and install all safety type disconnecting switches indicated on the drawings, specified or required by the National Electrical Code shall be furnished and installed under this Section unless noted as being furnished under other Sections, in which case they shall be installed under this section. Switches shall be externally operable. If the size is not shown on the drawings, Subcontractor shall size the disconnect switch in accordance with name plate data of the equipment they serve.
- B. Safety type disconnecting switches shall be **heavy duty**, 600 volt industrial type with quick-make, quick-break mechanism and interlocking cover which normally cannot be opened when the switch is in the "ON" position. Switches shall be single throw. Fusible switches shall be equipped with integral fuse clips. Switches shall have provision for padlocking in the open and closed positions. The operating handle shall be visible in either the on or off position.
- C. Disconnecting switches shall be as manufactured by Cutler Hammer, Square D, General Electric or Siemens.
- D. All fused disconnect switches mounted above 6'-6" shall be hook stick operable.
- E. No-fused "pull-out" disconnects shall be allowed only for indoor HVAC equipment in living units.

#### 1.02 INTERIOR

- A. Switch blades shall be operated by rotating shaft directly connected to the operating handle mechanism. Switch blades shall be clearly visible in the open position. All switches shall have clear shields over the incoming line lugs. Line shields shall be attached in such a way that switch blade covers or arc shields need not be removed for line installation. Line and load lugs shall be front removable and suitable for copper or aluminum, 60/75 degree wire through 200A sizes, 75 degree C wire for 400-800A sizes.
- B. Current limiting type RK1 dual element time delay fuses shall be furnished and installed in each fused disconnect; rating shall match nameplate rating of equipment served where different than that shown on drawings.

#### 1.03 ENCLOSURES

- A. All switches shall have NEMA type 1 general purpose enclosures unless indicated otherwise on the drawings. NEMA 3R covers shall be side hinged rather than top hinged. NEMA 1 and 3R switches through 200A sizes shall tangential knockouts for conduit line up against walls. NEMA 12 enclosures through 200A sizes shall be UL listed for conversion to NEMA 3R usage by opening a factory provided drain hole. All types of enclosures shall have metal nameplates affixed to the cover to show the switch type and rating and clearly indicate "ON" and "OFF" direction of handle movement. Provide hubs on all NEMA 4, 4X, or 3R type disconnects.

#### 1.04 CONTROL POLE

- A. Where required a direct action interlock or control pole shall be affixed to the switch base in such a

manner as to operate positively and only with the opening and closing of the switch power poles.

**END OF SECTION**

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## SECTION 16 200 - SWITCHBOARDS

### PART 1 GENERAL

#### 1.01 DESCRIPTION

- A. The work required under this section of the Specifications consists of the installation of all switchboards for use on systems 600 volts and below. All materials and devices which are an integral part of the switchboards shall be provided under this section of the Specifications.
- B. Switchboards as specified in these contract documents are free standing, dead-front, metal enclosed panels of one or more sections. The overcurrent devices may be individually or group mounted.

#### 1.02 QUALITY ASSURANCE

- A. Acceptable Manufacturers: Products of the following manufacturers, which comply with these Specifications, are acceptable:
  - Square D
  - Siemens
  - Cutler Hammer
  - General Electric
- B. Equipment Dimensions:
  - 1. Dimensions noted on the drawings are the maximum allowable and shall not be exceeded. Where switchboard(s) of acceptable manufacturers listed exceed the maximum dimensions, products of such manufacturers shall not be acceptable.
- C. Coordination:
  - 1. Coordinate installation with architectural and structural features, equipment installed under other sections of the Specifications and electrical equipment to insure access and so that clearance minimums are provided.

#### 1.03 SUBMITTALS

- A. Refer to Section 16100, "General Provisions", for submittal requirements.
- B. Shop Drawings: Submit shop drawings to indicate compliance with the contract documents.
  - 1. Include electrical characteristics and ratings for each switchboard with dimensions, mounting, bus material, voltage, bracing, ampere rating, mains, poles and wire connection, and any accessories.
  - 2. Include bussing diagram indicating each circuit breaker or fused switch position.
  - 3. Provide a schedule indicating overcurrent device, trip and size, poles, frame type, fuse size and type, or circuit breaker interrupting capacity.

### PART 2 PRODUCTS

#### 2.01 GENERAL

- A. Furnish all materials specified herein.

- B. The switchboard, circuit breakers, and fused devices shall be U.L. listed and bear the U.L. label. Where a switchboard is utilized as service entrance equipment, it shall be U.L. labeled as suitable for such use.
- C. The switchboard(s) shall be suitable for operation on the voltage system indicated on the drawings.

## 2.02 STRUCTURE ARRANGEMENT

- A. The switchboard(s) shall consist of free-standing, standardized vertical sections bolted together to form a continuous structure.
- B. Adequate space for conduit and conductors entering the top or bottom, in accordance with the National Electrical Code, shall be provided without structural interference, conductors shall be safely accessible without disrupting service.
- C. The structure and all components shall be finished in the manufacturer's standard corrosive-resistant primer and coating.
- D. Unless noted otherwise, switchboard sections shall be front accessible.

## 2.03 BUS ARRANGEMENT

- A. All busses shall be silver-plated copper, rated for a 65 degrees C. temperature rise above a 40 degrees C. ambient. The minimum bus bracing, in RMS-symmetrical-amperes, shall be as shown on the drawings.
- B. A neutral bus bar shall be provided, rated 100% of the main phase bus bar ampacity.
- C. The main bus shall be fully rated for the entire length of the switchboard.
- D. All non-current-carrying parts of the switchboard shall be grounded through the use of a continuous horizontal ground bus connected to vertical ground busses in each section. Ground bus rating shall meet or exceed the ampacity of the electrical service grounding electrode conductor(s).
- E. An accessible cable termination compartment shall be provided for incoming line termination. Lugs shall be suitable for terminating the size and quantity of conductors as indicated.
- F. All terminal lugs shall be U.L. labeled for AL or CU conductors rated for 75 degrees C.

## 2.04 MAIN PROTECTIVE DEVICE(S)

- A. The main protective device(s) shall employ fixed type mounting. The devices shall be individually mounted in the switchboard.
- B. Provide molded case circuit breaker(s):
  - 1. Breaker(s) shall be 600 V AC, 50/60 HZ rated. The frame and current ratings shall be as indicated on the drawings.
  - 2. Circuit breaker(s) shall be of the quick-make, quick-break, trip-free thermal magnetic type. Solid state breaker trip functions shall include adjustments for continuous amperage, long time pickup and delay, instantaneous, and ground-fault pickup and delay.
- C. Provide phase-loss protection:
  - 1. Phase loss protection system shall trip the main disconnect device(s) under single-phase condition or a voltage imbalance of 12% or more.
  - 2. The system shall not trip on total loss of voltage on all phases and shall have a built-in time delay of

- approximately 1.25 seconds. Capacitor trip component is required.
3. The system shall be equipped with L.E.D. fault indicators installed on the front of switchboard enclosure.

## 2.05 DISTRIBUTION PROTECTIVE DEVICES

- A. Provide molded case circuit breakers.
  1. Circuit breakers shall be provided with trip rating, poles and minimum interrupting rating as indicated on the drawings or specified herein.
  2. Circuit breakers shall be of the quick-make, quick-break, trip-free thermal magnetic type.
  3. Circuit breakers shall be bolted to the switchboard bus.
  4. Provide shunt trip device to electrically trip circuit breakers where indicated on the drawings.

## 2.06 AUXILIARY EQUIPMENT

- A. Identification:
  1. Refer to the electrical general section of these Specifications for nameplate requirements.
- B. Metering:
  1. Provide a multi-function, high accuracy digital power metering instrumentation module equipped with an LCD display. The module shall provide measurements for current, voltage and power parameters.
- C. Provide transient voltage surge suppression (TVSS) integral to the switchboard assembly complying with the following:
  1. TVSS shall be Listed and Component Recognized in accordance with UL 1283 and UL 1449 Second Edition (including highest fault current of Section 37.3).
  2. TVSS shall be installed by and shipped from the electrical distribution equipment manufacturer's factory as an integral device to the electrical equipment.
  3. TVSS shall provide surge current diversion paths for all modes of protection; L-L, L-N, L-G, N-G in WYE systems (L-N or L-G if at service entrance with bonding jumper), and L-L, L-G in DELTA systems.
  4. TVSS shall be modular in design. Each module shall be fused with a surge rated fuse and incorporate a thermal cutout device.
  5. A UL approved disconnect switch shall be provided as a means of disconnect in the switchboard device only.
  6. SPD shall meet or exceed the following criteria:
    - a. Maximum surge current capability (single pulse rated) shall be 120 KA per mode.
    - b. UL 1449 Listed and Recognized Component Suppression Voltage Ratings shall not exceed the following:

<u>VOLTAGE</u>	<u>L-N</u>	<u>L-G</u>	<u>N-G</u>	<u>MCOV</u>
208Y/120V	330	330	330	150V
480Y/277V	700	700	700	320V
  7. TVSS shall have successfully passed ANSI/IEEE C62.41-1991 10 x1000  $\Phi$ s waveform testing performed by a nationally recognized independent test lab.
  8. TVSS shall have a minimum EMI/RFI filtering of -50dB at 100 kHz with an insertion ratio of 50:1 using MIL-STD-220A methodology.
  9. TVSS shall be provided with 1 set of NO/NC dry contacts.
  10. TVSS shall have a warranty for a period of five years, incorporating unlimited replacements of suppressor parts if they are destroyed by transients during the warranty period. Warranty shall be the responsibility of the electrical distribution equipment manufacturer and shall be supported by their

respective field service division.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install switchboard on 3" high concrete pad, the horizontal dimensions of which shall exceed the base dimensions of the switchboard by 3" on all sides.
- B. Lace and group conductors installed with nylon tie straps. Only one conductor shall be installed under each terminal. Form and train conductors in enclosure neatly parallel and at right angles to sides of box. Uninsulated conductor shall not extend beyond one-eighths inch from terminal lug.
- C. Do not splice conductors in switchboard. Where required, install junction box adjacent to enclosure and splice or tap conductors in box. Refer to number of conductors in a conduit limitation defined in the conductors and cables section of the Specifications and do not exceed.
- D. Maintain conductor phase color code requirement described in the conductors and cables section of the Specifications.
- E. All switchboard breakers and fuses shall be labelled per the requirements of 16100 2.03 A.

**3.02 CLEANING AND ADJUSTMENT**

- A. After completion, clean the interior and exterior of dirt, paint and construction debris.
- B. Circuit breaker adjustments shall be performed as directed by the engineer at projection completion.

**END OF SECTION**

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## SECTION 16 450 - GROUNDING

### PART 1 GENERAL

#### 1.01 DESCRIPTION

- A. The work required under this section of the Specifications consists of furnishing, installation and connections of the building grounding system. Exterior branch circuit wiring and feeder conductors extended beyond the building are included. The building electrical system shall be 3 phase, 4 wire grounded wye 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.

#### 1.02 REGULATORY REQUIREMENTS

- A. Install a complete grounding system in accordance with the National Electrical Code.

### PART 2 PRODUCTS

#### 2.01 GENERAL REQUIREMENTS

- A. Provide all materials under this section of the specifications.
- B. All materials shall be new, U.L. listed, and bear a U.L. Label.
- C. Refer to Section 16120 for conductor specification.

#### 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 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 on sizes of equipment grounding conductors.
- C. Bonding jumpers shall be flexible copper bonding jumpers sized in accordance with the National Electrical Code tables for grounding electrode conductors.

#### 2.03 PANELBOARDS, TRANSFORMERS, AND DISCONNECT SWITCHES

- A. Provide each low voltage distribution and branch circuit panelboard with a copper equipment grounding bar brazed or riveted to the associated enclosures or cabinet and an insulated neutral bar.
- B. Provide a conductor termination grounding lug bonded to the enclosure of each equipment item.

#### 2.04 DEVICES

- A. Each receptacle and switch device shall be furnished with a grounding screw connected to the metallic device frame.

#### 2.05 GROUND RODS

- A. Ground rods shall be 3/4" x 10'-0 copper clad steel.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Ground all non-current carrying parts of the electrical system including raceways, equipment frames and enclosures, outlet boxes, junction boxes, and other conductive material in close proximity with electrical circuits.
- B. Service entrance and separately derived electrical systems, grounding electrode system
1. The neutral conductor of the electrical service serving the premises wiring system shall be grounded to the ground bus bar in the service equipment which shall be grounded to the cold water system, the ground rod system, and other grounding electrodes specified herein or indicated on the drawings. Grounding electrode conductors shall be installed rigid, nonmetallic conduit to point of ground connection, unless subject to physical damage in which case it shall be installed in galvanized rigid steel.
  2. Make connection to main water line entering the building. Make connections ahead of any valve or fittings whose removal may interrupt ground continuity.
  3. Bond together the following systems to form the grounding electrode system. All system connections shall be made to the electrodes as close as possible to the service entrance equipment and each connected at the service entrance equipment ground bus. Do not connect electrode systems together except at ground bus.
    - a. Cold water piping system
    - b. Ground rod system
    - c. Rebar in concrete footing
    - d. Structural steel metal building frame
    - e. Lightning protection system
  4. Ground the neutral of all dry type transformers to both building steel and to the nearest available point on the interior water piping system, which shall serve as the grounding electrodes for the separately derived system. In reinforced concrete structures building steel shall be considered to be reinforcing steel of vertical columns. Make connection to building steel with chemical weld type connector, in a location in unfinished space where the connection will not be subject to physical abuse.
  5. Grounding electrode connections to structural steel, reinforcing bars, ground rods, or where indicated on the drawings shall be with chemical exothermic weld connection devices recommended for the particular connection type. Connections to piping shall be with U.L. listed mechanical ground clamps.
  6. Where there is more than one service to a building or interconnected buildings, connect each service equipment ground bus together with a #3/0 copper conductor in PVC conduit.
  7. Bonding shall be in accordance with the National Electrical Code.
  8. Install ground rods where indicated on the drawings with the top of the ground rods 12 inches below finished grade.
  9. Ground the neutral and frame of the emergency generator to building steel and the main electrical service ground rod system. In reinforced concrete structures building steel shall be considered to be reinforcing steel or vertical columns. Make connection to building steel with chemical weld type connector, in a location in unfinished space where the connection will not be subject to physical abuse.
  10. Generator ground and neutral connections shall be bonded together.
- C. Equipment Grounding Conductor

1. Grounding conductors for branch circuits are not shown on the drawings; however, grounding conductors shall be provided in all branch circuit raceways and cables.
  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.
- D. Other Grounding Requirements
1. Each telephone backboard shall be provided with a No. 6 grounding conductor. When backboard is located in vicinity of electrical service equipment, the "point of grounding" of this conductor shall be the main cold water service with connections made ahead of any valves or joints. Remote backboards shall use building steel as "point of ground". Terminate conductor by stapling to backboard.
  2. At each building expansion joint flexible copper bonding jumpers shall be attached to building structure by chemical weld process. Install bonding jumpers in concealed locations that will not subject connections or jumpers to physical abuse. Install 100' on centers across expansion joints.

### 3.02 TESTING

- A. Upon completion of the ground rod installation, the Contractor shall test the installation in accordance with the "Electrical Testing" section of the GENERAL PROVISIONS of this Specification. 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.

**END OF SECTION**



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## SECTION 16 460 - DRY TYPE TRANSFORMERS

### PART 1 GENERAL

#### 1.01 DESCRIPTION

- A. The work required under this section of the Specifications consists of the furnishing, connection and installation of dry type transformers.

#### 1.02 QUALITY ASSURANCE

- A. The requirements of the following standards shall become a part of this Specification by reference:
1. Underwriters' Laboratories, Inc. (U.L.) Publications:  
No. 506, 1561: Transformers (1000 KVA, 3 phase and below; 167 KVA, 1 phase and below)
  2. National Fire Protection Association (NFPA):  
No. 70: National Electrical Code (N.E.C.)
  3. National Electrical Manufacturers Association (NEMA):  
No. St-20: Dry-type transformers for general applications
  4. American National Standards Institute (ANSI):  
No. C89.2
- B. Acceptable Manufacturers:  
General Electric  
Square D  
Siemens  
Cutler Hammer
- C. Coordination: Coordinate installation with architectural and structural features, equipment installed under other sections of the Specifications to insure transformer access, clearance minimums, and adequate ventilation are provided.

### PART 2 PRODUCTS

#### 2.01 GENERAL MATERIALS REQUIREMENT

- A. Furnish all materials specified herein and indicated on the drawings.
- B. All transformers shall be U.L. listed and bear a U.L. label.

#### 2.02 GENERAL PURPOSE DRY TYPE TRANSFORMERS

- A. Insulation System
1. Single phase 25 - 167 KVA and three phase 30 - 500 KVA: Transformers shall be rated for average temperature rise by resistance of 150 degrees C. in 40 degrees C. maximum ambient, 30 degrees C. average ambient. Transformer insulation system shall be UL rated as 220 degrees C. system.
  2. Three phase 3 - 15 KVA: Transformers shall be rated for average temperature rise by resistance of 115 degrees C. Insulation system shall be 180 degree C.
- B. Sound rating shall comply with NEMA and ANSI standards for KVA rating. Internal vibration dampening

shall be provided for all transformers.

- C. Single phase transformers rated up to 15 KVA shall have two, 5 percent full capacity taps below normal rated primary voltage. All other single phase and all three phase transformers shall be provided with six 2-1/2% full capacity taps, two above and four below normal voltage unless only four 2-1/2% taps, two above and two below normal voltage, are standard.
- D. Construction/Enclosures
  - 1. Transformers 30 - 1500 KVA: Transformer enclosures shall be ventilated and drip-proof with removable front and rear cover panels. Transformers shall be suitable for floor mounting, unless wall mounting is indicated on the drawings.
  - 2. Transformers up through 25 KVA: Transformer housings shall be totally enclosed, non-ventilated and drip-proof. Access to wiring compartment shall be permitted via removable panel.
- E. Core assemblies and the center ground point of the coil secondaries shall be grounded to the enclosure by flexible ground straps. Provide grounding lug at the enclosure bonding location for connection of three conductors: the primary and secondary equipment grounding conductors and the grounding electrode conductor.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Installation shall provide not less than twelve inch clearance from combustible materials and not less than six inch clearance from walls or equipment. Floor mounted transformers shall be mounted on neoprene, waffle type vibration pads 5/8" thick. Where transformers are mounted on channels angles, transformers shall be bolted to structure with 5/8" thick vibration pad between transformer base and structural channel. 4" thick concrete housekeeping pads shall be used for all floor mounted transformers.
- B. Provide working clearance and full accessibility for transformer as required by the National Electrical Code.
- C. Primary and secondary connections to dry type transformers shall be made with flexible conduit.
- D. The secondary windings of each dry type transformer shall be grounded in accordance with the National Electrical Code requirements for separately derived electrical systems. Extend a grounding electrode conductor from the transformer grounding lug to the nearest building structural steel and to the nearest available point on the interior water piping system. Connect the primary and secondary feeder, equipment grounding conductors to the grounding lug, also. Refer to the grounding section of these Specifications for additional requirements.

#### **3.02 CLEANING AND ADJUSTMENT**

- A. Prior to job completion, clean the interior and exterior of dirt, paint and construction debris.
- B. Touch up paint scratched surfaces with factory furnished touch up paint of the same color as the factory applied paint

**END OF SECTION**

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## SECTION 16 500 - LIGHTING

### PART 1 GENERAL

#### 1.01 DESCRIPTION

- A. This Section specifies the lighting system requirements.
- B. All fixtures shall be current source, provided with lamps ready to use.

#### 1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Refer to another Division for the ceiling systems.
- B. Lighting system shall be coordinated with the ceilings.

#### 1.03 SUBSTITUTIONS/VALUE ENGINEERING

- A. Substitution/value engineering requests shall be accompanied by complete manufacturers data with model numbers, cut sheets with options indicated, and a full photometric report. For exterior lighting, a computer generated point by point calculation shall be provided.
- B. All substitution requests shall be submitted in completion to engineer at least ten (10) days prior to bid date.

### PART 2 PRODUCTS

#### 2.01 BALLASTS

- A. All fluorescent lamp ballasts shall be low-loss, high power factor Class "P", with "A" sound rating and shall bear UL and CBM certifications. Ballast case temperature shall not exceed 90 degrees C.
- B. Electromagnetic ballasts shall be General Electric "Maxi-Miser 1". Advance "Mark III", Magna-Tek or Universal "SLH" unless indicated otherwise on Drawings. Electronic, solid state ballasts shall be by Universal, Magna-Tek or Valmont.
- C. All HID lighting fixtures shall have a high power factor, regulated output ballast provided by the fixture manufacturer, pre-wired with a glass tube fuse holder and fuse on each primary hot lead.

#### 2.02 LAMPS

- A. Fluorescent lamps shall be energy saving type, 3500EK, CRI 75, of size and wattage as scheduled on the Drawings, unless noted otherwise on Light Fixture Schedule. They shall be General Electric or equal as manufactured by Sylvania or Philips unless indicated otherwise on Drawings. Lamps shall have a rated life of 20,000 hours minimum at three (3) hours per start.
- B. Incandescent lamps shall be of type, size and voltage as scheduled on the Drawings. Lamps shall be of the extended service type with a rated life of 2,500 hours. Reflector lamps (R and PAR) shall have a rated life of 2,000 hours for the standard type and 4,000 hours for the "Quartz" or "Krypton" types. Quartz lamps shall be clear with a rated life of 2,000 hours. Lamps for 120 volt operation, except for the quartz tubes, shall be rated 130 volts for longer life.

**2.03 LIGHTING FIXTURES**

- A. Letter designations beside outlet symbols on Drawings correspond to letter designations in Lighting Fixture Schedule.
- B. Recessed incandescent fixtures, where used in an insulated ceiling, shall be equipped with thermal protection and shall bear the UL label indicating the suitability for such use.
- C. Lens material for recessed fluorescent fixtures shall be 100% virgin acrylic, 0.125" thick in a square prism pattern similar to KSH-K-12 or as scheduled in Lighting Fixture Schedule.
- D. Site lighting poles shall meet or exceed the local wind loading requirements of authority having jurisdiction.
- E. Concrete pole bases shall be required for site lighting poles.

**PART 3 EXECUTION**

**3.01 LIGHTING FIXTURES**

- A. Provide lighting fixtures at all locations indicated by distinctive symbols or notes on the Drawings.
- B. Lighting fixtures shall be secured to ceiling grid with clips or screws and two #12 steel wires mounted to opposite corners of light fixture secured to structure.
- C. Locations of lighting fixtures on the electrical drawings are approximate. Refer to Architectural reflected ceiling plan for actual locations of fixtures and mounting heights.
- D. Lighting fixtures installed in plaster and stucco ceiling shall have plaster frame and shall be of the flanged type.
- E. Fixtures recessed in concealed-spline tile and in gypsum board ceilings shall be flanged.
- F. Surface or recessed fixtures in or on plastered ceilings shall be supported from pieces of support channel spanning across the main supporting channels and shall not depend on the metal lath for support.
- G. All recessed fixtures in suspended ceiling areas shall be connected using flexible conduit and No. 14 AF wire. The flexible conduit shall be connected to the fixture and the cover of the outlet box. Do not use "Daisy-Chain" method of connecting fixtures. Provide equipment grounding conductor in each flexible conduit.
- H. Each recessed lighting fixture shall have a trim to match the type of ceiling (exposed grid, metal panel, etc.) in which it is being installed, except where noted otherwise on the plans.
- I. Each lighting fixture recessed in a concrete wall shall have a junction box or wiring compartment provided inside the fixture housing. Provide conduit access into the fixture concealed.

**END OF SECTION**

## SECTION 16 580 - PERFORMANCE LIGHTING SYSTEMS

### PART 1 GENERAL

#### 1.01. SUMMARY

A. Includes but not limited to -

1. Complete and operational systems as described in Contract Documents.
  - a. Provide miscellaneous terminations, hardware and components required for proper operation.
  - b. The Drawings TH-0.0 through TH-12.1 correspond to this Section, as well as certain electrical system Drawings which show conduit and wiring for the Performance Lighting System and certain EAV Drawings which show conduit and connection devices for signal wiring.
  - c. Drawings and Specifications are complementary. Provide any item of work indicated by the specification but not shown on the Drawings, or shown on the Drawings but not indicated in the specification, as if shown or indicated on both.
2. Test equipment and tools.
3. Daily and final cleanup of debris caused by work under this Section.
4. Ladders, lifts, hoists or scaffolding required for installation.
5. Warranties.
6. Documentation and instruction.

B. Related Sections -

1. General & Supplementary Conditions and Division 01 apply to this Section.
2. Unless otherwise noted, the term Contractor shall refer to the Performance Lighting System Contractor.
3. Work excluded from this Section -
  - a. Installation of conduit and AC power circuits serving the dimmer cabinets and distribution strips.
  - b. Installation of conduit and back boxes for signal wiring.
  - c. Mounting the distribution devices in the rigging and elsewhere as shown in these documents.
  - d. Installing gridiron junction boxes, wall pocket back boxes and back boxes for floor pockets installed in the stage floor.
4. Making all AC power connections for the system.
5. Refer to Division 16 for any additional details.

#### 1.02 RELATED SECTIONS

- A. Alternate Performance Lighting Positions and Accessories: Section 01 030 - Alternates

#### 1.02. REFERENCES

- A. PLASA/USITT Recommended Practice for DMX 512
- B. USITT AMX 192 Analog Multiplex Data Transmission Standard
- C. National Electric Code (NEC)
- D. National Electric Safety Code (NESC)
- E. ESTA Recommended Practice and Supplement for Ethernet Cabling Systems in Entertainment Lighting Applications

#### 1.03. SYSTEM DESCRIPTION

- A. Include labor, materials, tools, transportation, supervision, coordination, testing, documentation and instruction -
1. The Performance Lighting System shall consist of:

- a. Dimmer cabinets with dimmers and necessary electronic drivers for the dimmers.
- b. 1 control console(s).
- c. 1 Stage Manager's Panel.
- d. 4 House Light Control Station(s) (including one at SMP).
- e. 1 House light control processor
- f. Signal wiring and associated connection devices.
- g. Distribution devices such as floor and wall pockets, drop boxes and distribution strips.
- h. Integral work light pigtails in the distribution strips.
- i. Stage lighting fixtures ("instruments") lamps and associated loose equipment.
- j. 2 follow spots.
- k. Stage cables and connectors.

#### 1.04. ACCEPTABLE MANUFACTURERS

- A. The following companies are acceptable to provide the equipment, parts, materials and services under this section:
  1. Electronic Theater Controls (ETC)/3030 Laura Lane/Middleton, WI 53562  
Telephone: (608) 837-4116/Fax: (608) 836-1736
  2. Strand Lighting Inc./Post Office Box 9004/ Rancho Dominguez, CA 90221  
Telephone: (310) 637-7500/Fax: (310) 632-5519
- B. No alternates or substitutions are allowed.

#### 1.05. BID DOCUMENTATION

- A. Verify accuracy and completeness of Contract Documents. Verify compatibility of products specified. Notify Architect and Theatre Consultant of any discrepancies at least ten days in advance of bid date.
- B. Bid Package documentation -
  1. Price in accordance with the Bid Form.
  2. Equipment list itemized to match the Bid Form. Include quantities, manufacturer, description and specification number.
  3. Statement that the bid is based on the products specified in the Contract Documents.
  4. Statement that the Contractor is authorized to represent the manufacturer(s) specified.
  5. Statement that the equipment specified has been tested and approved by Underwriter's Laboratories.
  6. Statement describing the business relationship between the manufacturer and the installer (i.e., installed by manufacturer, or by subcontractor, or by dealer, etc.)
  7. One year Warranty. Detail services included and excluded. If accepted, Warranty proposal shall commence when the system has been accepted by the Owner. Warranty shall specifically state the method, terms and conditions required for providing 12-hour turn-around time for repairing dimmers and control systems. Warranty may be annually renewable thereafter at a fee negotiated between the Owner and the Contractor.

#### 1.06. POST-AWARD SUBMITTALS

- A. Show Project name, date, Architect, Contractor and this Section number on Submittal documents (Title page only on bound /multiple items).
- B. All materials and equipment supplied under this section shall be new and unused, and shall meet or exceed the latest published specification of the manufacturer. The Contractor shall base his bid on the latest model of each piece of equipment that is available at the time of bidding and shall supply the model and type of equipment upon which the bid is based.
- C. Completed AIA Document A305 Contractor's Qualification Statement including a list of three

installations which are similar in size, type and scope to the work specified in this Section. Include project name, date of installation, name of contact and phone number.

D. Submit five (5) sets of Post-Award Submittals to the Architect within thirty days after award of the Contract.

1. Product Data shall be neatly bound in binders with tabbed dividers between sections as follows:

- a. Title page with space for submittal stamps.
- b. Table of Contents.
- c. Equipment list for each part of the system with -
  - 1) Quantities.
  - 2) Manufacturers' model number(s).
  - 3) Description and specification paragraph number.
  - 4) Denote deviations from specified equipment on this list. Deviations shall be noted in letters of a contrasting color at least ¼" high.
- d. Clearly identify each specified item on catalog data sheets and show quantity of each item and/or options available.
- e. Catalog data sheets for any proposed equipment not included or reasonably inferred from the Contract Documents which the Contractor believes essential for the operation of the system.

2. Shop Drawings, neatly bound -

- a. Title page with space for submittal stamps.
- b. Page(s) with drawing schedule, general notes, symbol and device legends, conventions and any other details pertinent to the entire drawing set.
- c. Indicate arrangement of rack mounted dimming equipment, locations of AC wiring and signal connections. Equipment shall indicate manufacturer, model number and function.
- d. Construction details of custom fabricated items and accepted equipment modifications. Include complete parts lists, schematic diagrams, and dimensions required for proper assembly.
- e. Indicate proposed colors and finishes for custom fabricated items.
- f. Show connections and interfaces for remote control devices of types other than those specified in this section.
- g. Scaled Drawings -
  - 1) Plans-not less than 1/8" = 1'-0".
  - 2) Details-not less than 1/4" = 1'-0".

E. Submit Product Data Binders and Shop Drawings in one package.

F. Unless specifically exempted in writing by the Architect, do not commence any work until Post-Award Submittals are accepted.

G. If the Architect is unable to accept the Post-Award Submittal due to errors, omissions or inaccuracies by the Contractor, the Contractor shall be responsible for costs incurred by the Architect for additional review.

#### 1.07. INITIAL TEST REPORT AND FINAL CONTRACT CLOSE-OUT SUBMITTALS

A. Submit two complete sets of the following to the Architect when the installation is substantially complete -

1. Results of initial electrical and electronic tests.
2. Description of corrective procedures and adjustments.
3. Resulting performance of each system components after adjustments.

B. Submit two sets of preliminary versions of the Final Contract Close-out Submittals. Final Observation and Training will not be scheduled until the Preliminary Final Contract Close-out Submittals are accepted by the Architect and returned to the Contractor.

C. If the Architect is unable to accept the Initial Test Reports or Final Contract Close-out Submittals due to errors, omissions or inaccuracies by the Contractor, the Contractor shall be responsible for costs incurred by the Architect for additional review.

1.08. FINAL CONTRACT CLOSE-OUT SUBMITTALS

- A. Provide four complete sets of the following after acceptance of the Final Contract Close-out Submittals and after the Final Testing and Adjustments have been performed, but before Owner Instruction, -
1. Product Data Binder, neatly bound with tabbed dividers between sections -
    - a. Title page.
    - b. Table of Contents.
    - c. Warranty -
      - 1) Warranty statement for a minimum one year system warranty. Clearly explain conditions and limits of warranty and list items specifically excluded, such as lamps, fuses, normal wear/tear or other expendable items.
      - 2) List components having manufacturers' warranties of more than one year and list the length of their warranties.
      - 3) List contractor's name, address, service department telephone number and procedure for obtaining service. Warranty shall specifically state the method, terms and conditions required for providing 12-hour turn-around time for repairing dimmers and control systems.
    - d. Equipment list for each System -
      - 1) Final quantities.
      - 2) Manufacturer and model number(s).
      - 3) Description of each item.
    - e. Equipment manuals -
      1. Manufacturers' manuals, arranged alphabetically.
      2. List manufacturers' addresses for any products not included above.
    - f. Operating Instructions -
      1. Typed description of each system including: key features and operational concepts (i.e., control console, house light control, stage manager's panel) with short non-technical instructions for set-up & operation.
      2. Manufacturer's instruction manual for operation of the control systems and dimmers. A hard copy of the instruction manual shall be provided. "On-line" or electronic manuals do not meet this requirement.
    - g. Maintenance instructions -
      1. Typed description of routine maintenance procedures schedules such as changing filters, vacuuming, covering control console, etc.
      2. Replacement parts lists for expendable and owner-replaceable components such as dimmer modules, lamps, lenses, color media holders, etc.
    - h. Test reports of tests performed on electrical and electronic components.
    - i. One line diagram of the system components.
  2. Full-size Project Record Drawings -
    - a. Modify accepted shop Drawings to record the actual installation as approved by the Architect.
    - b. Record serial numbers for all electrical and electronic devices, performance lighting fixtures excepted.
    - c. Indicate actual location of each of the devices, performance lighting fixtures excepted.
    - d. Provide an inventory list of all performance lighting fixtures and associated loose equipment, showing manufacturer, model number and serial number, if applicable.
- B. Contractor shall distribute Final Contract Close-out Submittals -
1. Two copies to the Owner or his designated representative during, or no later than, the two weeks after the instruction session. Provide **four (4)** duplicates of each key required for operation of the systems.
  2. Two copies to the Architect no later than two weeks after the instruction session. Provide two duplicates of each key required for operation of the systems with each manual.

1.09. PROJECT CONDITIONS

- A. On-site storage of equipment -
1. Store on-site equipment inside in a manner which will not interfere with the work of other trades.
  2. All components shall be stored in such a fashion as to keep them clean, dry, and protected from denting, abrasion, or other damage.
  3. Distribution strips, floor pockets and wall pockets shall be kept secured in their original shipping containers until they are installed.

4. Miscellaneous parts shall be kept secured in their original shipping containers until they are installed.
  5. The dimmer cabinets, dimmers, control console and other control station(s) shall be stored in their original shipping containers and shall be warehoused under temperature and humidity controlled conditions where dust or dirt will not accumulate on them or infiltrate their housings. These items shall not be installed until such time as all construction operations that generate dirt, dust, smoke, and sparks have been completed.
- B. Verify job-site conditions related to work under this Section. If irreversible job site conditions are discovered which require the equipment to be installed in a different manner than indicated, or if the site is not in an appropriate condition to receive the installation, notify the Architect, make recommendations, and proceed with the necessary changes only after receipt of written approval from the Architect. The Contractor will assume responsibility for any loss or damage to the equipment should he fail to properly document unsuitable on-site conditions.
- C. Remove unnecessary tools and equipment, unused materials, packing materials and debris from each area where work has been completed.
- D. Clean areas around system equipment and verify the inside of each equipment rack is free of wire strippings and debris.
- E. Coordinate work with other trades and coordinate scheduling with the construction supervisor to minimize delays. Failures in coordination shall not be reason for claim for additional payment.

#### 1.10. WARRANTY

- A. Refer to General Conditions and Supplementary Conditions.
- B. Provide complete warranty repair or replacement of products or workmanship for one year at no cost to Owner, except in case of obvious abuse. During the warranty period, answer service calls and requests for information within eight hours. Repair or replace faulty items and correct faulty workmanship within twelve hours of service calls.
- C. For components having manufacturers' warranties of more than one year, register warranties in the Owner's name and honor those warranties for their entire period.

## PART 2 PRODUCTS

### 2.01. PERFORMANCE LIGHTING PRODUCTS

- A. Dimmer Cabinet: The dimmer cabinets shall conform to the following:
1. The dimmer cabinet shall be pre-wired to provide for the number and type of dimmers shown in the Dimmer Schedule in the Drawings. Dimmer cabinets shall be designed in such a way that dimmer modules shall not require any tools for installation or removal.
  2. In those systems where electronic driver and communication devices are included in the dimmer cabinets, these systems shall be provided either with redundant ("backup") systems or with spare cards which may be exchanged for those provided with the system in the event of failure.
  3. Micro-processor control card(s) shall be designed to be driven by the control signal(s) specified herein and with any control system in which the console output is **DMX 512**.
  4. Where manufacturers provide for computerized system analysis via telephone connection to the factory, that type of analysis service shall be provided.
  5. A low-noise, forced-air ventilation system shall be housed in the rack to maintain the proper operating temperature of all components in the dimming system if the design of the dimmer cabinet so requires.
  6. All required air filters shall be provided when a part of the manufacturer's design. At the time of Owner acceptance, replace filter(s) with new and provide spare filter(s).
  7. Each rack shall be provided with copper bussing, supported by appropriate insulators, and served by circuit breakers. Feeders shall be terminated at each dimmer bay at a panel-mounted female plug. A neutral buss shall be provided for the connection of individual neutral wires and shall also provide connection at each dimmer bay female plug.

8. Dimmer Racks shall be designed and wired to conform to the type of power specified in the Electrical Section of these Construction Documents.
- B. Dimmer: Shall be designed for operation upon receiving a signal from any of the control stations specified, and shall meet the following minimum criteria:
1. Any dimmer set to the same intensity level and using the same dimmer curve as any other dimmer, shall correspond in power output to all other such dimmers, and shall repeat the same setting and shall operate consistently within 0.3% of its programmed curve.
  2. Each dimmer shall be a plug-in type chassis, factory wired and designed to slide into the dimmer rack without the use of tools. Power pins shall be mounted in a self aligning housing to prevent damage during insertion in the rack, and shall interface with a panel-mounted female plug in the back of each dimmer bay.
  3. Non-metallic dimmer housings shall not be acceptable.
  4. Each dimmer shall provide line voltage regulation within 0.6% over the entire AC input voltage range.
  5. Any dimmer shall be capable of being switched to a non-dim module from the control console, at which time the dimmer shall become a zero voltage, solid-state, on/off relay with the capacity to control lamps, motors, and other electrical devices at full power, and up to its rated current capacity.
  6. Each dimmer shall be protected by a fully magnetic single-pole circuit breaker, with a rating equal to that shown on the dimmer chassis label. In the event any dimmer is loaded beyond its rated maximum current, the circuit breaker shall operate rapidly enough to protect all devices in the dimmer module.
  7. Silicon Controlled Rectifiers (SCRs) shall be mounted in matched pairs. Dimmers using electrically live heat sinks shall not be acceptable.
  8. Each dimmer shall be identified in an approved manner with the manufacturer's name, address, rating in amperes and volts, catalog ID number, and UL label.
  9. The system power efficiency at any voltage and any load shall be in excess of 96% minimum.
  10. Dimmers shall be suitably filtered by properly sized chokes mounted within the plugin chassis to prevent radio-frequency and/or other electronic noise in other theater electronic gear and/or theatre audio system.
  11. Lamp filament vibration and hum shall be suppressed by the chokes to a level of 27 dBA maximum as measured at ear level at any seat in the facility.
  12. Dimmers of the same capacity shall be fully interchangeable within the system. In systems employing more than one type of dimmer, dimmer modules and rack slots shall be mechanically keyed so that rack slots will only accept like-type dimmer modules.
  13. System shall be grounded in accordance with the manufacturer's installation instructions and the Electrical Drawings.
- C. Control Console: The Control Console shall be a microprocessor based control system specifically designed and constructed for the control of entertainment lighting and presentation systems. The control console shall provide for the following:
1. Individual control of at least 1024 dimmers.
  2. A minimum of 250 control channels, providing a separate control channel for each dimmer, including houselight dimmers, while providing simultaneous operation of a minimum of 100 attribute channels.
  3. Memory capacity of at least 600 cues per show.
  4. A minimum of 24 sub-masters.
  5. A minimum of 50 effect memories with a minimum of 99 steps each.
  6. A minimum of 2000 user programmable macros.
  7. "Show" Memory. The cues and associated show program information shall be stored in non-volatile memory. Any set of "show" cues, or portions of "show" cues shall be down-loadable to a disk or diskette. Console shall support downloading to a peripheral printer for producing hard copies of "show" cues and related information.
  8. Operating Program Memory. The Operating Program shall be stored in an internal non-volatile re-programmable memory allowing program upgrades by disks, diskettes or other method provided by the manufacturer. Program upgrades shall not require exchange of internal memory devices. The control console shall support a disk or CD loadable Operating Program.
  9. The control console shall be a free standing table top unit with one or more separate color high resolution 12 inch minimum color video monitor(s). The console shall contain all operator controls and the video monitor(s) shall display selected information regarding its operation.
  10. The control console shall provide at least these types of controls:
    - a. Command Keypad

- b. Function Keypad
  - c. Channel Level Wheel
  - d. Grand Master
  - e. Blackout Control
  - f. Manual Fade-time Control
  - g. Rate Wheel
  - h. "Go" Command
  - i. Stop/Back Command
  - j. Playback Command
11. The console shall be provided with an integral power switch.
12. The console shall be provided with industry standard connectors for DMX 512 and AMX 192 signals.
- D. Stage Manager's Panel: The Stage Manager's Panel, as located in the Drawings, shall be as follows:
- 1. Control shall provide for individual operation of at least 5 dimmer groups, and shall be capable of controlling any dimmer(s) selected by from among any of the stage lighting circuits. This panel shall be programmable from the main control console and/or from a hand-held controller, if specified.
  - 2. The panel shall be equipped with a keyed switch to prevent unauthorized operation. When the main console is in operation, it shall lock out the Stage Manager's panel, except for programming purposes.
- E. House Light Control Station(s)
- 1. House light control station(s) shall provide DMX signals to the house light dimmers in the performance lighting dimmer cabinets. House lights shall be programmable through the main control console and shall be included in the programmed settings as a part of the Stage Manager's panel in 2.1.D.
  - 2. House light control stations shall consist of a Grand Master and Sub-Masters with these control designations:  
XXXXX XXX  
XXXXX XXX  
(PENDING COORDINATION)  
XXXXX XXX  
XXXXX XXX  
XXXXX XXX
- F. Interface With Other Control Devices
- 1. Control signal faceplates shall be located as shown on the drawings with proper connectors for devices called for on the drawings or elsewhere in this specification.
  - 2. In ALL cases, Control Signal Faceplates shall contain at least one black, flush mount RJ 45 connector wired for Category 5 signaling conforming to IEEE 802.3. Shop drawings shall call out the connector type and color and shall call for Category 5 wiring to be installed and terminated at these locations.
- G. DMX Distribution: A complete operating DMX distribution system shall be provided as shown on the drawings and conforming to the following:
- 1. DMX distribution Device(s) capable of splitting the DMX signal from the Main Lighting Control Console into a minimum of six (6) fully bi-directional ports
  - 2. The Distribution Device shall optically isolate distribution points in such a fashion that they do not require the use of terminators when not in use. Devices that employ DOL (Direct-on-line) technology are not acceptable.
  - 3. Attenuation, degradation, or the introduction of noise to the original DMX signal by the Distribution Device is not acceptable.
  - 4. The Distribution Device shall operate on 120VAC / 60 Hz power, be UL approved and be rack mountable.
  - 5. Patch panels as described on the Drawings.
  - 6. Suitable rack(s) with a locking cover secured as directed by the Owner. Suitable wall mount rack(s) secured to the upstage side of the proscenium wall at the Stage Manager's Position and/or Company Position. Provide rack(s) with set-back equipment mounting rails such that the front cover can be closed and locked with XLR style patch cords in use. Fill all unused spaces with black blank panels.

2.02. DISTRIBUTION PRODUCTS

- A. Floor Pocket: Device shall consist of a back box with integral panel-mounted connectors of the type shown in the Drawings. Wire outlets and terminate wiring at an internal terminal block with molded barriers. Terminal block shall include permanent circuit numbering corresponding to the outlet numbering shown in the Drawings. Provide two terminals for each circuit and size terminals for the circuit amperage required. Provide a grounding strip to terminate ground wires for all circuits. Connectors shall be black. Cover and hinged lid shall be of cast iron at least 0'-0.25" thick with skid-resistant pattern. Install cover flush with finished floor surface.
- B. Distribution Strip: Fabricate distribution strips from 16-gauge steel to the sizes shown in the Drawings. Provide the type(s) of connectors shown at the spacing indicated. Connectors shall be black. Wire outlets and terminate wiring at an internal terminal block with molded barriers. Terminal block shall include permanent circuit numbering corresponding to the outlet numbering shown in the Drawings. Provide two terminals for each circuit and size terminals for the circuit amperage required. Provide a grounding strip to terminate ground wires for all circuits. Provide mounting brackets for all distribution strips as indicated in the Drawings.
1. Provide integral work light pigtails and circuitry in the Electric Batten distribution strips as shown in the Drawings.
- C. Drop Box: Fabricate drop boxes from 16-gauge steel. Provide the type(s) of connectors shown in the Drawings. Connectors shall be black. Wire connectors and terminate wiring at an integral terminal block with molded barriers. Terminal block shall include permanent circuit numbering corresponding to the outlet numbering shown in the Drawings. Provide two terminals for each circuit and size terminals for the circuit amperage required. Provide a grounding strip to terminate ground wires for all circuits. Provide stage instrument C-clamps for each box as indicated in the Drawings.
- D. Gridiron Junction Box: Gridiron junction boxes shall be provided at each location where an interface is needed between the AC conduit wiring and the borderlight cables. Boxes shall be fabricated from 16-gauge steel with a removable cover and an internal terminal block with molded barriers. Terminal block shall include permanent circuit numbering corresponding to the outlet numbering shown in the Drawings. Provide two terminals for each circuit and size terminals for the circuit amperage required. Provide a grounding strip to terminate ground wires for all circuits. Provide Lamicaid™ labels, for the cover identifying the box and showing the appropriate circuit numbers.
- E. Borderlight Cable: Provide sufficient multi-conductor electric cable for each distribution device shown with cable in the Drawings. Sufficient cable shall be provided for each device to permit full travel of the device as a part of stage rigging operation. Number and gauge of wires in each cable shall be sufficient for the circuitry shown plus one spare pair for every 10 pairs.
- F. Strain Relief Device: Install the type of strain relief devices indicated in the Drawings. Strain relief devices shall be sized to match the electric cables and shall have an integral device for clamping the cables to prevent slippage. The minimum bend radius of the installed cables shall not be less than four cable diameters.
- G. Cable Cradle: Provide cable cradles for integration into the rigging as shown in the Drawings.

## 2.03. STAGE LIGHTING PRODUCTS

- A. Fixed-Focus Ellipsoidal Spotlight: Fixtures with a beam diameter of 8 degrees. Fixtures shall be equipped with four trimming shutters and a gobo slot at the focal plane. Controls on the fixture shall permit changing the focus from hard-edged to soft-edged without the use of tools. Temperature of the control handles and knobs shall not exceed a temperature of 85 degrees Fahrenheit when the fixture is in operation. Provide one gobo holder for each fixture. Lens barrels shall rotate on the instrument housing. Fixture shall produce not less than 95 footcandles at 50 feet. Color frame size for these fixtures shall not exceed 7 ½" x 7 ½".
1. Quantity: 8
- B. Fixed-Focus Ellipsoidal Spotlight: Fixtures with a beam diameter of 12 degrees. Fixtures shall be equipped with four trimming shutters and a gobo slot at the focal plane. Controls on the fixture shall permit changing the focus from hard-edged to soft-edged without the use of tools. Temperature of the control handles and knobs shall not exceed a temperature of 85 degrees Fahrenheit when the fixture is in operation. Provide one gobo holder for each fixture. Lens barrels shall rotate on the instrument

housing. Fixture shall produce not less than 145 footcandles at 40 feet.

1. Quantity: 30

- C. Fixed-Focus Ellipsoidal Spotlight: Fixtures with a beam diameter of 17 degrees. Fixtures shall be equipped with four trimming shutters and a gobo slot at the focal plane. Controls on the fixture shall permit changing the focus from hard-edged to soft-edged without the use of tools. Temperature of the control handles and knobs shall not exceed a temperature of 85 degrees Fahrenheit when the fixture is in operation. Provide one gobo holder for each fixture. Lens barrels shall rotate on the instrument housing. Fixture shall produce not less than 160 footcandles at 30 feet.

1. Quantity: 18

- D. Fixed-Focus Ellipsoidal Spotlight: Fixtures with a beam diameter of 25 degrees. Fixtures shall be equipped with four trimming shutters and a gobo slot at the focal plane. Controls on the fixture shall permit changing the focus from hard-edged to soft-edged without the use of tools. Temperature of the control handles and knobs shall not exceed a temperature of 85 degrees Fahrenheit when the fixture is in operation. Provide one gobo holder for each fixture. Lens barrels shall rotate on the instrument housing. Fixture shall produce not less than 170 footcandles at 20 feet.

1. Quantity: 6

- E. Fresnel lens Spotlight:

1. Fixtures shall be equipped with nominal 0'-6" diameter lens which produces a round, soft edged pattern. Fixture shall be equipped with controls to adjust the beam from "spot" to "flood" settings and which secure the lamp and reflector unit at the setting selected without the use of tools. Temperature of the control handles and knobs shall not exceed a temperature of 85 degrees Fahrenheit when the fixture is in operation. Color media holder shall rotate on the lens holder. Fixture shall produce not less than 445 footcandles at 20 feet at "spot" setting.

a. Quantity: 18

2. Fixtures shall be equipped with nominal 0'-8" diameter lens which produces a round, soft edged pattern. Fixture shall be equipped with controls to adjust the beam from "spot" to "flood" settings and which secure the lamp and reflector unit at the setting selected without the use of tools. Temperature of the control handles and knobs shall not exceed a temperature of 85 degrees Fahrenheit when the fixture is in operation. Color media holder shall rotate on the lens holder. Fixture shall produce not less than 185 footcandles at 30 feet at "spot" setting.

a. Quantity: 5

- F. "PAR" Fixture: Fixture shall be designed to hold a compact tungsten filament lamp. Fixture shall be equipped with baffles in the housing to reduce spill to a minimum, provide adequate cooling for the reflector and to prevent discoloring or deforming color media. Fixture shall be fabricated from die cast aluminum and be capable of accepting lamps up to 750W. Fixture shall be supplied with interchangeable borosilicate lenses to achieve a photometric range including VNSP through WFL. Fixture shall produce not less than 125 footcandles at 35 feet with the MFL lens installed. Fixtures shall be equipped with a color media holder.

a. Quantity: 18

- G. Borderlight (striplight): Fixtures 6'-0" long each with 12 compartments for individual lamps. Wire fixtures for 3 color circuits. Provide connecting cables at one end and circuited female outlets at the opposite end for "daisy chaining". Connectors shall be 2P+G type. Fixtures shall accept lamps of up to 300 Watts.

1. Borderlights shall be equipped with Union-type three-pin (2P+G) connector, trunnions for floor mounting and hanger irons with C-clamps for mounting on pipe battens.

2. Three-color circuited borderlights shall be supplied with red, blue and green roundels and roundel holders.

3. Quantity: 12

- H. Followspot:

1. Luminaire shall be specifically designed as a manually operated followspot fixture.

2. Fixture shall employ advanced shot-arc lamp and ballast technology. Lamp shall provide a minimum Kelvin color temperature of 5000 degrees and be capable of hot restart. The lamp ballast shall be integral to the fixture housing and be easily serviceable/replaceable. Fixtures using incandescent lamps are not acceptable. The lamphouse shall be easily accessible and relamping shall be achieved without changing lamp trim settings, and without the use of tools.

3. Fixture shall have an integral, removable, self-canceling seven color boomerang featuring a full-size

- color capture plate for each frame. The color of the operating handles for all color frames shall be black.
4. Iris plates shall be fabricated from nichrome steel and the leaves arranged in such a fashion as to maintain smooth operation over the entire range of operation without binding or excessive burning or warping, even if left in the fully closed position with the lamp on for extended periods.
  5. External operation of all functions, including, but not limited to, color changing, dowsing, iris, and changing lens position shall be through easily accessible and operable insulated handles.
  6. The fixture shall be equipped with a dowsing function and the dowsing shall interrupt the light beam in front of the iris.
  7. The fixture shall operate on 120VAC and power shall be supplied through a parallel blade U-ground male (Edison) connector and controlled by an integral power switch. Current draw shall not exceed 10 amperes and the unit shall be equipped with a properly sized, resettable, integral circuit breaker.
  8. Each unit shall be supplied with a stable, three-legged base equipped with locking casters and leveling jacks. The yoke provided with the base shall be equipped with adjustable brakes for pan and tilt.
  9. The fixture shall be fan cooled and the overall noise level shall not exceed 55dBA measured at 1M from any point on the unit.
  10. Lamp rating shall be 400 to 600 watts. Fixture shall produce not less than 700 footcandles at 60 feet on "spot" setting.
  11. Quantity 2

#### 2.04. LOOSE EQUIPMENT/EXPENDABLES

- A. Stage Cable: Provide 50 pieces of 12 gauge (AWG), flexible stage cable with Union-type (2P+G) grounded three-pin connectors. Connect cable to connectors using matching lugs firmly and neatly soldered to the wire. Provide the following lengths and quantities:
1. Length: 5'
    - a. Quantity: 10
  2. Length: 10'
    - a. Quantity: 20
  3. Length: 25'
    - a. Quantity: 15
  4. Length: 50'
    - a. Quantity: 5
- B. Side Arm: Provide side arms for mounting fixtures on ladders. Side arms shall be equipped with a C-clamp for attaching the side arm. The pipe arm shall be equipped with a cast T that shall slide freely on the arm. The T shall be drilled at the bottom to accept a machine bolt of the same size and type that attaches the C-clamps to the fixtures supplied under this contract. The arm shall also be equipped with a cap or other stop at both ends to prevent the C-clamp or "T" from sliding off the arm. Each side arm shall be provided with a Safer Sidearm™ Junior as manufactured by A.C.T. Enterprises, Inc., 5637 46th Ave. SW, Seattle WA 98136, or equivalent. Provide the following lengths and quantities:
1. Length: 18"
    - a. Quantity: 18(1T)
  2. Length: 24"
    - a. Quantity: 12(1T)
  3. Length: 36"
    - a. Quantity: 6(2T)
- C. Extra Lamp. Provide extra lamps for each of the lamps specified for each of the fixtures provided under this contract.
1. Quantity (for each lamp type): 50% spares

#### 2.05. GENERAL PRODUCT REQUIREMENTS

- A. The workmanship on all custom equipment shall incorporate neat and mechanically acceptable practices such as clean drilled and punched holes without flash, hand smooth finish for all sheared, machined, and cut edges, and proper fit of components and contiguous parts without irregularity where matching is intended. All material shall be free of any solvents, cutting fluids or any other material, which may interfere with a good paint bond or cause the wiring insulation to degrade over a period of time.

- B. All distribution equipment shall be listed as UL approved.
- C. Unless specifically noted otherwise, distribution equipment connectors shall be compatible with existing equipment or equipment listed elsewhere in this specification.
- D. Finish for all distribution equipment shall be black and may be either baked enamel or baked powder coated. Type and color of finish shall be consistent for all distribution items. Provide custom color finishes as directed by the Architect for those distribution devices identified in the Drawings as requiring special finishes.
- E. All fixtures, except follow spots, shall be equipped with a Union-type three-pin grounded (2P+G) connector, C-clamp fixture hanger, media color holder and safety cable.
- F. Burned or distorted shutters, cracked or chipped lenses, darkened or distorted reflectors, burned or discolored lamp sockets, burned or discolored male plugs (when apparently caused by arcing) and/or discolored or distorted lamps shall be cause for replacement of the entire affected fixture at the Contractor's expense.

### **PART 3 EXECUTION**

#### **3.01. PREPARATION**

- A. Verify compliance of the location and access to the following items before beginning installation -
  - 1. Galleries and catwalks where the equipment is to be installed.
  - 2. Physical mounting of the distribution devices.
  - 3. Electrical connections to the distribution devices.
  - 4. Installation of the conduit for the Performance Lighting System signals.
  - 5. Integration of the distribution strips into the stage rigging.
- B. Notify the Architect in writing of any discrepancies.

#### **3.02. INSTALLATION**

- A. General -
  - 1. Execute work in accordance with all local and state codes, ordinances and regulations.
- B. Equipment Racks -
  - 1. Pre-assemble and test racks before delivery to job site.
  - 2. Fill unused equipment mounting spaces with blank panels or vent panels in accordance with the manufacturer's standards.
  - 3. Distribution of electrical power within the dimmer racks shall provide for approximating an even distribution of load throughout the system.
  - 4. Clearly label equipment in the dimmer rack for dimmer, circuit and circuit breaker number.
- C. Site Operations -
  - 1. Install equipment according to manufacturers' recommendations -
    - a. Install signal wiring and associated connection devices in accordance with the manufacturer's instructions. Faceplates shall be plumb and square to the building.
    - b. Install Stage Manager's Panel and House Light Control Panel(s) in accordance with the manufacturer's instructions.
    - c. Set up Control Console and associated equipment in accordance with the manufacturer's instructions.
    - d. Do not install equipment in a manner different than indicated. Notify the Architect of any discrepancies, make recommendations, and proceed with necessary changes upon receipt of written approval from the Architect.
  - 2. Remove dimmer modules and examine cabinets, filters and ventilating fans for construction dust and debris. Clean as may be necessary before re-installing dimmers.
  - 3. Energize the dimmers only after verifying that the power provided to the cabinets matches the type of wiring distribution and power provided for by the manufacturer.
  - 4. Verify that each numbered outlet in the system is operated by the dimmer with the corresponding number and operates only when that corresponding dimmer is energized. This shall be achieved by means of the hardwire connection to the dimmer socket and not through software manipulation.

5. Verify the correct operation of the control console and other control stations. Verify that the software installed in the dimmer racks, control console and elsewhere operates correctly.
6. Verify that each outlet has been wired properly as regards the location of the "hot," "ground," and "neutral" wires.

**D. Loose Equipment**

1. Deliver all fixtures and related loose equipment and parts to the Owner in the original packaging at the time the system is accepted. Items turned over to the Owner at this time shall match the inventory of items in 2.3 and 2.4.

**E. Wiring Practices -**

1. Perform installation of signal wiring in accordance with the references in Paragraph 1.2.
2. Do not pull wire or cable through any box, fitting or enclosure where change of raceway alignment or direction occurs.

**F. Labeling -**

1. Circuits shall be permanently labeled throughout the entire system at each termination point and elsewhere as may be required for circuit tracing.
2. Provide self-adhesive 0'-2" tall white letters on a black background for numbering all circuitry on distribution devices located out of the sight of the audience.
3. Provide permanently attached Lamicoid™ labels, with white 1/2-inch block letters on black background for distribution devices which are located in sight of the audience (see Drawings).

**3.03. OBSERVATION OF FINAL TESTS AND OPERATION**

- A. Schedule a time for the Architect or his designated representative to observe the final tests and operation of the system. At the same time, submit a letter to the Architect stating that the conditions set forth in 3.2.C.4.,5.,and 6. have been met. Notify the Architect and Construction Manager at least seven days in advance of the requested observation.
- B. Furnish a technician who is familiar with the system to demonstrate to the satisfaction of the Architect or his designated representative that the system is installed in accordance with the intent of the Contract Documents and is fully operational.
- C. Under the direction of the Architect or his designated representative, demonstrate that all circuits operate as required and that the control console performs the specified functions.
- D. If the Architect or his designated representative are unable to perform a complete observation of the system operation due to errors, omissions, problems or inaccuracies by the Contractor, the Contractor shall be responsible for costs incurred by the Architect for additional review.

**3.04. INSTRUCTION**

- A. Furnish a qualified individual to instruct the Owner or his designated representative regarding the design, features and proper operation of the Systems.
- B. Provide a minimum of four hours of instruction. Coordinate the instruction times through the Architect, Theatre Consultant and the Construction Manager. Following the instruction session, submit copies of documentation showing date, time, systems shown and names of persons attending the instruction session to the following -
  1. Architect-two copies.
  2. Owner-two copies.
- C. Attend one technical rehearsal and the opening night of the first full-scale performance to assist the owner in the operation of the systems.

**3.05. ACCEPTANCE**

- A. Upon completion of the work, the Owner may elect to verify test data as part of the acceptance procedure. Provide personnel and equipment, at the convenience of the Owner, to reasonably demonstrate system performance and to assist with such tests without additional cost to the Owner.

These tests and demonstrations are in addition to the instructional requirements outlined in Paragraph 3.4.B.

- B. Final acceptance of the installation by the Owner and Architect will be based upon the report of the Architect or his designated representative following the Final Observation of System Operation and upon receipt of acceptable Final Contract Close-out Submittals and Instruction documentation.
- C. The failure of a representative of the Owner or Architect to condemn any defective work or material shall not release the Contractor from the obligation to promptly remove and replace the same at any time before final acceptance upon discovery of said defective work or material without claim for additional payment.

**END OF SECTION**



**SECTION 16 700 - FIRE ALARM SYSTEM**

**PART 1 GENERAL**

1.01 DESCRIPTION

- A. This section covers the complete installation of a new automatic fire alarm system, as well as necessary materials, labor, calibration, testing and training.
- B. The complete installation shall be in compliance with NFPA 70, 72, 101 (Life Safety Code) and NEC Article 760. The installation shall also comply with state and local ordinances, as well as the Americans with Disabilities Act (Public Law 101-336).
- C. All equipment supplied shall be listed for the purpose for which it is used and installed in accordance with any instructions included in its listing.
- D. All equipment must be new and bear the U.L. (Underwriters Laboratories) label.

1.02 SHOP DRAWINGS

- A. Fire alarm shop drawings shall contain the following:
  - 1. Specification sheet/sheets of technical data on each hardware component.
  - 2. Specification sheet(s) on wiring to be utilized.
  - 3. One line schematic riser diagram made specifically for this job.
  - 4. Calculation for sizing batteries and power supplies.
  - 5. Sequence of operation for the entire system.
  - 6. Copy of vendor's NICET fire alarm certificate (level III or higher).
  - 7. Verification of central supervising station (U.L. Certified).
  - 8. Equipment and service warranty.
  - 9. Scaled floor plans showing fire alarm device locations and wire routing.

1.03 ACCEPTABLE MANUFACTURERS

- A. Products of the following manufacturers which comply with these specifications are acceptable:
  - 1. Notifier (NESCO)
  - 2. Siemens
  - 3. Edwards
  - 4. Simplex
  - 5. Silent Knight

1.04 STORAGE AND HANDLING

- A. Smoke detectors shall be covered with plastic wrapping if installed prior to the completion of painting, sanding and other work producing dust, etc.
- B. The fire alarm control panel(s) shall not be installed until its designated room has been completely painted and cleaned.

## PART 2 PRODUCTS

### 2.01 CONTROL PANEL/SYSTEM DESCRIPTION

- A. The fire alarm system shall be an electrically supervised, power limited, low voltage (24 VDC), non-coded, multiplexed, fully analog, addressable system. The fire alarm control panel shall be of modular design for ease of future system addition or modification (up to 20% addition capacity).
- B. The control panel shall provide system status via an 80 character liquid crystal display and shall also have the following features:
  - 1. Power "ON" Light Emitting Diode (L.E.D.)
  - 2. System Reset Switch
  - 3. System Alarm L.E.D.
  - 4. System Trouble L.E.D.
  - 5. Alarm Silence Display
  - 6. Trouble Silence Display
  - 7. Control panel shall be lockable.
  - 8. Normally open and normally closed sets of contacts for control of remote equipment/devices.
- C. Batteries shall be mounted in space provided in the fire alarm control panel. Control panel shall include automatic charging circuit to maintain battery/batteries in charged condition. Batteries may be lead acid or nicad; charging circuit shall match battery type.
- D. The battery/batteries shall have sufficient ampere-hour capacity to operate the system under normal supervisory conditions with A.C. power disconnected for 24 hours, and at the end of that period to operate all alarm notification appliances for 10 minutes. For calculation purposes, all audible devices shall be tapped at a minimum of one (1) watt.
- D. The battery/batteries shall have sufficient ampere-hour capacity to operate the system under normal supervisory conditions with Assembly A.C. power disconnected for 24 hours, and at the end of that period to operate all alarm notification appliances for 2 hours (15 minutes of evacuation alarm operation at maximum load shall be considered equivalent). For calculation purposes, all audible devices shall be tapped at a minimum of one (1) watt.
- E. The system shall operate from one (1) 20 ampere, single phase, three (3) wire 120 V.A.C. circuit. The circuit breaker shall be labelled "Fire Alarm Circuit Control".
- F. The fire alarm system shall respond to a fire emergency through the operation of the following systems:
  - 1. Smoke damper control and automatic shut down of HVAC air systems shall occur upon activation of respective duct smoke detector.
  - 2. Automatic audible/visual notification (via speakers/strobes) shall be provided throughout the facility upon activation of a flow switch, manual station, or area smoke detector. Pre-recorded voice message capability shall be provided for automatic transmission to building occupants during alarm conditions. A standard evacuation message shall be provided under this contract. The message player must be capable of transmitting a customized message of up to 3 minutes long. A self-contained speaker will be provided to allow testing of the message without disturbing the occupants of the facility. The system shall be configured to allow selective voice paging. If any manual control switches are activated, the control panel operator shall be able to make announcements via a push-to-talk paging microphone over the preselected speaker circuits (where applicable).
  - 3. Signal output to the U. L listed central station (for fire system reporting) via a D.A.C.T. communication device (or similar U.L. listed "fire" device). Provide and install 3/4" conduit from the panel to the main

telephone backboard.

4. Smoke door release (where applicable) shall occur generally throughout the entire facility.
  5. Tamper switch operation shall cause a trouble signal to indicate audibly and visually at the control panel.
  6. Fusible link operation for all fire shutters.
  7. Activation of elevator lobby or elevator equipment room smoke detector shall cause immediate, non-stop return of all respective elevators to designated discharge level. Provide and install 3/4" conduit from control panel to elevator controller(s).
  8. Operation of pressurization fans and smoke exhaust fans.
  9. Notification at control panel upon activation of kitchen hood fire suppression system.
  10. Fire pump status shall be displayed for the following conditions:
    - a) Power failure
    - b) Pump operation
    - c) Phase reversal
    - d) Alternate power source
- G. Supervision:
1. Initiating Device Circuits (IDC) shall be Style D (Class B).
  2. Signaling Line Circuits (SLC) shall be Style 4 (Class B).
  3. Indicating Appliance Circuits (IAC) shall be Style Y, #12 wire (Class B).
  4. Each independently supervised circuit shall include a discrete panel readout to indicate disarrangement conditions per circuit.
  5. Power failures, opens, or grounds shall be audibly and visually indicated at the control panel and the remote annunciator (where applicable). A green "power on" LED shall be displayed continuously while incoming power is present.
- H. Provide remote annunciator panel with 80 character liquid crystal display, audible signal and alarm/trouble lights.
- I. Fire Department Communication System:
1. Provide a two-way Voice Communication System between the Central Control, Emergency Phones and Emergency Phone Jacks. All wires between the Central Control and remote units shall be continuously supervised. Any fault which occurs shall be reported visually and audibly at the Central Control.
  2. A master telephone control module shall be furnished to provide processing of all two-way communication functions. This module shall include an audible sonalert for call and trouble signalling, a trouble silence switch with ring back, a trouble indication and supervising monitor circuit.
  3. A black master telephone handset with flexible-coiled self-winding fire foot cord shall be provided and recessed within a protective panel-mounted enclosure at the command center. This enclosure shall also provide mother board locations for the phone control and flasher/busy tone oscillator. Phone shall be capable of accessing public telephone system.
  4. At a minimum provide one line (talk) circuit per stairwell, one per elevator lobby, one per elevator cab and, one for the fire pump room. Each line(talk) circuit shall be monitored for shorts, opens and grounds. Each line module shall contain a "call" and "trouble" indication and, a two position switch to enable two-way voice communication between remote and master phones.

## 2.02 FIELD DEVICES

- A. Manual Stations: Semi-flush, addressable, double action type. Station shall be constructed of high impact red polycarbonate.

- B. Area Smoke Detectors: Smoke detectors shall be of the analog, addressable, photoelectric type. A pulsed diode pilot lamp, visible from the floor, shall be provided to indicate alarm condition or component failure. Diode pilot lamp may be pulsed diode type for normal and steady for alarm trouble indication. Detectors shall be self supervising for component failure as well as line failure. Detector failure or removal of detector shall initiate (zone) trouble signal. Detector shall be capable of monitoring 900 square feet of unobstructed area with spacing not to exceed thirty feet on center. Smoke detectors shall be ceiling mounted and shall be interconnected into alarm system to function in same manner as the manual station. Detectors shall report analog level of smoke/dirt to panel.
- C. Duct Smoke Detectors: Detectors shall be of the analog, addressable, photoelectric type. The unit shall consist of a detector and an air sampling assembly housed in a casting designed for duct mounting. The sampling tubes shall extend completely across the duct. Detectors shall have remote test switches with L.E.D. indicators in an observable location for periodic detector testing. Detectors shall report analog level of smoke/dirt to panel. Each switch shall be labelled to identify location of duct smoke detector.
- D. Audible/Visual Devices: Audible/visual devices shall be speakers with flashing visual appliances with the word "FIRE" written on the lens. The speakers shall produce at least 15 dBa above ambient noise level. Audible and visual devices (including the combination device) shall utilize a 4" electrical backbox. Visual devices shall produce a minimum of 75 candela, with a constant flash rate of one (1) flash per second. The device color shall be white.
- E. Addressable relays shall be provided as required to accomplish all mechanical systems and other related control functions.
- F. Addressable input monitoring devices shall be provided as required to monitor existing water flow, tamper switch, and other devices.
- G. Heat detectors shall be addressable, fixed temperature type rated at 135 degrees F., unless noted otherwise on drawings.
- H. Fire phone jacks shall mount on stainless steel single gang plates labelled in red "Fire Emergency Phone."
- I. Single/Multiple Station Smoke Detectors With Integral Sounder: Detectors shall be 120V (with battery back-up) with built-in evacuation horn and power-on indicator. Where more than one is installed in a living unit, activation of one detector shall trigger all horns in that unit.
- J. Single/Multiple Station Smoke Detectors With Integral Sounder: Detectors shall be addressable, system-connected with built-in evacuation horn and power-on indicator. Where more than one is installed in a living unit, activation of one detector shall trigger all horns in that unit.
- K. Monitoring of remote fire protection valves on site (if applicable) shall be accomplished via fire alarm system connection.

### PART 3 EXECUTION

#### 3.01 GENERAL

- A. Contractor shall obtain approval from Owner as to the final and exact location of each control panel and

remote annunciator prior to installation.

- B. All wiring and cable installed exposed in a space, concealed inside a wall, concealed above a non-accessible ceiling or underground outside the building shall be installed in conduit. All line voltage wiring shall be installed in conduit. All low voltage wiring installed above accessible ceilings may be installed without conduit by using cable with a jacket which is UL listed for installation in a return air plenum. Plenum rated cable shall be tied to the building structure at approximately 6'-0" on center using cable ties. Plenum cable shall pass through fire rated walls by drilling a hole in the wall and installing a conduit with bushings on each end through the wall. Install the cable through the conduit and seal the opening around the conduit and the hole in the conduit with a UL listed fire rated sealant.
- C. Provide necessary programming to accomplish the indicated system operation and control functions.
- D. All conduit, control wiring, power wiring, relays, and other equipment and devices required to form a complete and operational system shall be provided as part of this Contract.
- E. All wiring requirements for shielding certain conductors from others or routing in separate raceways shall be as recommended by the manufacturer.

### 3.02 WARRANTY

- A. Equipment, materials, workmanship and system performance incorporated into the work shall be guaranteed for a period of one year from the time the Owner receives beneficial use of Fire Alarm System and the acceptance tests herein specified have been satisfactorily completed. Any defects due to faulty materials, methods or installation or workmanship within this period shall be promptly repaired or replaced.
- B. Vendor shall provide pricing for system inspections for a period of four additional years after the initial 12 month warranty as a bid alternate to the Owner. Provide the following inspections per N.F.P.A. 72 and N.F.P.A. 101.
  - 1. Semi-annual inspections on all initiating devices and alarm devices.
  - 2. Quarterly inspections on all sprinkler system water-flow, pressure switches, tamper switches and control panel batteries.
  - 3. Annual inspections on all control panels and other system components.
- C. In addition to the above, provide emergency service calls for normal and after hours. Submit hourly rates as specified below. The submitted rates must also be maintained for the additional four years following expiration of the 12 month warranty.
  - 1. Hourly labor rate: \$\_\_\_\_/hour (8 a.m. through 5 p.m. Monday through Friday, excluding holidays, response guaranteed within 2 hours).
  - 2. Hourly labor rate: \$\_\_\_\_/hour (all other times, response guaranteed within 4 hours).
- D. Spare parts: Provide the following spare equipment items to the Owner upon project completion:
  - 1. Addressable modules: 2
  - 2. Smoke detectors: 2
  - 3. Manual stations: 2
  - 4. Duct mounted smoke detectors: 1
  - 5. Audible/visual devices: 4

### 3.03 TESTING AND CERTIFICATION

- A. Testing and certification of the life safety system per NFPA 72 2-2 shall be as required by the Fire Marshal

and Engineer. The Contractor shall be responsible for identifying the required testing, coordinate scheduling, and conducting the test necessary to achieve occupancy certification and assurance of complete system operation. Contractor shall submit proof of complete system operation signed by the Fire Marshal to Engineer and Owner.

**END OF SECTION**

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## SECTION 16 721 - SECURITY ALARM SYSTEM

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Design of security alarm system.
- B. Material and labor for installation of complete system.

#### 1.02 REFERENCES

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; 1999.
- B. U.L. - Underwriters' Laboratories

#### 1.03 SYSTEM OPERATION

- A. Security Alarm Sequence: Upon activation of a security alarm, after any programmed delay period, all security alarms shall sound (including exterior sirens) and an alarm shall be transmitted off-site via digital communicator.

#### 1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard cut sheets for all products to be installed.
- C. Shop Drawings: Indicate layout of entire system including point-to-point wiring diagram for the control panel connections and the wiring to at least one zone of initiating devices and one circuit of signalling devices.
- D. Manufacturer's Instructions: Indicate all requirements for installation.
- E. Maintenance Data: Provide 3 copies of manufacturer's manuals for troubleshooting and maintenance. Provide record drawings of completed installation with detailed catalogue sheets describing system components.
- F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURER

- A. General Electric
  - 1. Control Panel: Intrusion Control Panel, 8-192 Zone Network.

#### 2.02 COMPONENTS

- A. Alarm Control/Communicator Panel
  - 1. Features:
    - a. SEIA reporting format.
    - b. Downloading capabilities.
    - c. Zone number and English descriptor for each supervised zone.
    - d. Integral siren driver and battery charging circuit.

- e. Two separate programmable entry delays.
  - f. Dual phone line monitoring (minimum of one dedicated line).
  - g. Control communicator: Provide a Regency Model 4720 or 2820 with Model 4175 dual phone line monitor with ring detector.
  - h. Key Station: Provide a commercial remote key station with LCD display and membrane keypad. Provide a Regency Model 4660 Medium Commercial remote.
  - i. Security Alarm Initiating Circuit: Provide required number of supervised alarm initiating circuits.
  - j. Supplemental functions: Provide alarm activated supplemental repays as required. Provide a Regency Model 4180 Status Display module as required.
- B. Stand-by Power Supply:
- 1. Power Supply: 120VAC, single phase.
  - 2. Control/Communicator: Provide a Regency Model 6812, 12 VDC, 5 Ah battery or equivalent.
- C. Cabinet Enclosure:
- 1. Painted steel cabinet, surface mounted with locking device.
- D. Security Alarm Initiating Devices
- 1. Motion Detectors: Provide U.L. listed combination microwave and passive infrared motion detectors. Features include a loss of power alarm, tamper protection, and RFI immunity.
    - a. ASC (Ademco Sensor Company) Model 996/998
    - b. Alternates: Similar and GE compatible.
- E. Alarm Signaling Devices
- 1. Exterior Security Alarm Siren: The exterior siren shall consist of a siren driver and speaker assembly capable of 125db sound pressure at 10 feet. The siren shall be mounted in a weatherproof and tamperproof protected steel enclosure.
  - 2. Interior Security Alarm Siren: The interior horn shall be a piezo horn capable of 105 db sound pressure at 10 feet.
- F. Wiring
- 1. Horns, sirens, lamps, and relay circuits: No. 14 AWG copper type THNN insulation.
  - 2. Initiating devices: No. 16 AWG copper fixture wire with type TF insulation.
  - 3. Conduit: Provide electric metallic tubing for all wiring. Flexible metallic tubing in lengths not exceeding 3 feet may be run to individual devices.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

#### 3.02 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01400.

#### 3.03 STARTING EQUIPMENT AND SYSTEMS

- A. Provide manufacturer's field representative to prepare and start equipment.
- B. Adjust for proper operation within manufacturer's published tolerances.
- C. Demonstrate proper operation of equipment to Owner's designated representative.
- D. Advise Owner in writing that all systems are installed and operating properly.

#### 3.04 TRAINING

- A. Train Owner's personnel in the operation of the Intrusion Alarm Control Panel and all devices. Training shall be for up to 4 hours and conducted on site.

**END OF SECTION**



## SECTION 16 750 - TELECOMMUNICATION CONDUIT SYSTEM

### PART 1 GENERAL

#### 1.01 DESCRIPTION

- A. Provide a complete telecommunication conduit system as shown on the plans and herein specified for wiring by others which includes raceways for voice, data, CATV, CCTV, and security systems.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Conduits, Sleeves and Backboards
  1. Entrance facility conduits shall be installed to extend 4" beyond the finished surface it penetrates and be equipped with pull rope or mule tape with a breaking strength of 600 pounds. Entrance facility conduits that penetrate external building walls shall be installed in "Jack Moon" type plugs used in conjunction with expandable grout to waterproof the penetration.
  2. Conduits used for horizontal cabling shall be equipped with nylon bushings and polypropylene pull line with a breaking strength of 200 pounds.
  3. All underground entrances shall have metallic sleeves through building foundation walls, extending to undisturbed ground to avoid shear.
  4. All 90 degree bends shall have a radius of not less than 10 times the diameter of the conduit.
  5. Telephone equipment backboards shall be provided where indicated on the plans. Backboard shall be constructed of 3/4" B-D INT DFPA grade plywood secured to wall and painted grey.
  6. Provide and install conduits as indicated on electrical drawings.
  7. Telephone service entrance conduits shall be 2 @ 4" inside diameter schedule 40 PVC, unless shown otherwise on drawings.
  8. CATV service entrance conduit(s) shall be 1 @ 2" inside diameter schedule 40 PVC, unless shown otherwise on the drawings.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Provide 1 #6 ground conductor in 3/4" conduit from each telephone equipment backboard to the nearest accessible cold water pipe or building ground for telephone company's connection.
- B. Provide a Brady "Write-On" label on each conduit at each telephone wood backboard and designate on the label the room or rooms served by the conduit.
- C. Label all telephone outlet boxes (indicate as voice, data, or combination using the symbols as shown on the plans). Labels shall be affixed on the inside back of the box.
- D. In areas with non-accessible ceilings, telephone conduits shall be continuous from the outlet box to the telephone equipment backboard. In areas with accessible ceilings, conduits shall be routed from outlet box/backboard to 6" above the ceiling and terminated with a nylon grommet.
- E. Each conduit homerun can serve one to three outlet boxes. For conduit homeruns serving one outlet box,

conduit size shall be 3/4". For homeruns serving 2 or 3 outlet boxes, conduit size shall be 1".

- F. Maintain a minimum cover of 24 inches below final grade of conduits, or greater as required by the telephone utility company.
- G. Service entrance conduits shall be provided and installed by the electrical contractor in accordance with the Telephone Utility Company rules, regulations, and installation guide.
- H. Service entrance conduits shall extend from the telephone equipment backboard to the utility demarcation/customer termination point on the site as directed by the local telephone utility company.
- I. It is the responsibility of the electrical contractor to coordinate the type of telephone cable used and the local authorities acceptance or rejection of exposed cabling with the electrical work as indicated on the plans. This coordination shall be performed by the electrical contractor prior to the bid of construction documents.
- J. All raceway systems, outlets, lighting, grounds, backboards, cabinets, and pull lines relative to the telephone system shall be completely installed prior to the telephone wiring contractor arrival on site.

**END OF SECTION**

## SECTION 16 995 - ELECTRICAL COMMISSIONING REQUIREMENTS

### PART 1 GENERAL

#### 1.01 COMMISSIONED SYSTEMS

- A. Commissioning will be performed on the following systems and equipment:
  - 1. Electrical Equipment
  - 2. Lighting Controls
  - 3. Fire Alarm Systems

#### 1.02 COMMISSIONING RESPONSIBILITIES

- A. The Electrical Contractor shall be responsible for, in conjunction with the CxA, scheduling, supervising and coordinating start-up, testing and commissioning activities specified in this section.
- B. The Electrical Contractor shall review submittal data for conformance with requirements, shall authorize the initial starting of equipment and systems in a manner to avoid damage during construction, shall oversee start-up, testing and balancing and shall document that the requirements of each system have been accomplished.

#### 1.03 COMMISSIONING PHASES

- A. Construction Phase
  - 1. Attend commissioning meetings. These meetings will initially be monthly until functional performance testing begins. The Meetings will than be weekly or as often as necessary.
  - 2. Report in writing to the CxA concerning the status of activities as they affect the commissioning process and the status of deficiencies found during site visits or the performance of functional testing.
  - 3. Provide the CxA with data sheets and submittals for equipment to be commissioned.
  - 4. Provide documentation to the CxA for development of functional performance testing procedures. This documentation shall include manufacturer installation, start-up, operation and maintenance procedures. The CxA may request further documentation as necessary for the development of functional performance tests.
  - 5. Provide a copy of the O&M manuals and submittals of commissioned equipment to the CxA for review. Notify the CxA when commissioning activities not yet performed or scheduled will delay construction.
  - 6. Execute all electrical portions of equipment checklists provided by the CxA.
  - 7. Correct any outstanding noncompliance items before beginning functional performance testing
- B. Acceptance Phase
  - 1. Place equipment and systems into operation and continue the operation during each working day of the testing and commissioning activities as required.
  - 2. Before initiation of testing ensure all pre-functional checklists, calibrations, and functional tests of the

electrical systems and associated controls have been completed and reviewed by the CxA.

3. Provide skilled technicians to operate electrical systems during functional performance testing under the direction of the CxA.
  4. Correct deficiencies as identified by CxA and retest equipment as required.
  5. Prepare O&M manuals in accordance with the Contract Documents.
  6. Provide specified training to the Owner's operation personnel.
  7. Maintain marked-up as-built drawing and produce final as-built drawings.
  8. Coordinate with equipment manufacturers to determine requirements to maintain validity of warranty.
- C. Warranty Period:
1. Execute seasonal or deferred functional performance testing, witnessed by the CxA.
  2. Correct deficiencies and make necessary adjustment to O&M manuals and as-built drawings for observations made during seasonal or deferred functional performance testing.

## **PART 2 PRODUCTS**

### **2.01 TEST EQUIPMENT**

- A. Standard test equipment required to perform functional performance testing shall be provided for the equipment or system being tested.

## **PART 3 EXECUTION**

### **3.01 START-UP PLAN AND PRE-FUNCTIONAL TESTING**

- A. Pre-functional testing shall be required for each piece of equipment to ensure that the equipment and systems are properly installed and ready for operation, so that functional performance testing may proceed without delays. Sampling strategies shall not be used for pre-functional testing.
- B. As a minimum the start-up and check-out plan shall consist of the following:
1. The manufacturer's standard start-up and check out procedures copied from the installation manuals. The plan shall include checklists and procedures with specific spaces for recording and documenting the inspection of each procedure and a summary block for deficiencies and explanations.
  2. Equipment Pre-Functional Checklists (to be provided by the CxA)
    - a. Equipment Verification Checklist
      - (1) Ensures electrical specifications on equipment match specifications required by construction documents.
    - b. Pre-Installation Checklist
      - (1) Ensures that equipment to be installed is staged properly, free of damage and ready to be installed.

c. Physical Installation Checklist

- (1) Ensures equipment has been installed in accordance with manufacturer's specifications and meets requirements of the construction documents.

- C. Four weeks prior to start-up, schedule equipment and systems start-up and check out and notify the Owner and the CxA in writing. The execution of Pre-Functional checklists, start-up and check out shall be directed and performed by the Contractor. The CxA shall be present for the start-up check out and pre-functional testing of the first unit of each type of equipment to be commissioned.
- D. Completed Pre-functional checklists shall be completed and submitted to the CxA for review. Any non-compliance items should be noted on these checklists. The Contractor shall notify the CxA when outstanding items have been corrected.
- E. Start-up and pre-functional testing must be performed before functional performance testing may proceed.

3.02 FUNCTIONAL PERFORMANCE TESTS

- A. Accomplish functional performance testing of equipment as defined by the CxA.
- B. Functional performance testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of the system at the discretion of the CxA and the Electrical Contractor.

3.03 DEFERRED TESTING

- A. Seasonal and/or deferred testing shall be accomplished as required. These tests shall be executed, documented and deficiencies corrected. Adjustments or corrections to the O&M manuals and as-built documents required by the results of the testing shall be made prior before the deferred testing is considered complete.

3.04 RECORD DRAWINGS

- A. Upon completion of the project, submit record drawings indicating as-built conditions of power, lighting and other electrical systems and incorporating changes made during construction.
- B. Record drawings shall, as a minimum, include:
1. Equipment location and orientation
  2. Major utility locations and sizes

3.05 MAINTENANCE DURING CONSTRUCTION

- A. Equipment operated prior to the date of substantial completion shall be maintained in accorded with manufacture's recommendations and turned over to the Owner in a "like new" condition.

3.06 TRAINING

- A. Provide Owner's designated personnel with comprehensive training in the understanding of the operation and maintenance of equipment and systems specified in Division 16.
- B. The Electrical Contractor shall prepare and submit a syllabus describing an overview of the training program; how, when and where the training sessions will occur; names and qualifications of lecturers, and descriptions of each lecture.
- C. The appropriate trade or manufacturer's representative shall provide the training on each major piece of

equipment. Training shall be based and derived from operational and maintenance requirements found in the O&M manual. It is therefore imperative that the O&M manuals be present at each training session.

- D. The training program should include the following, as appropriate:
1. Training will normally start in classroom setting, followed by hands-on training at each piece of equipment. The training shall explain equipment modes of operation, such as start-up and shutdown. The training shall also include instruction on equipment operation during emergency modes, such as fire alarm and loss of power. Maintenance techniques, requirements and troubleshooting techniques shall also be explained in detail.
  2. Preventative maintenance and special tools and recommended spare parts inventory shall be discussed.
  3. Use of the O&M manual shall be discussed.
  4. Safety and health issues with each piece of equipment shall be discussed.
  5. All warranties and guarantees shall be discussed, including procedures to maintain all warranties and guarantees.
  6. Local equipment overrides and operation of equipment not tied into the control system shall be discussed.
- E. Training shall not occur until functional performance testing is complete unless approved by the Owner.

**End Of Section**