FULTON COUNTY

Vision

People *Families* *Neighborhoods*

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 49976K-RS

Fairburn Neighborhood Senior Center

For

General Services Department
Building Construction

PRE-BID CONF. TIME AND DATE: 2:00 P.M. May 2, 2006
BID DUE TIME AND DATE: 11:00 A.M. June 7, 2006
PURCHASING CONTACT: Rholanda Stanberry 404.730.4200
E-MAIL: Rholanda.stanberry@co.fulton.ga.us

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

VOLUME 2 – ITB MANUAL
Issued for Bid

TABLE OF CONTENTS

BID MANUAL *(Volume I of 2)*

DIVISION 0 CONTRACTING & PROCUREMENT REQUIREMENTS

00 020 INVITATION TO BID
00 100 INSTRUCTIONS TO BIDDERS
00 110 BID SUBMITTAL FORMAT & CONTENT
00 125 FULTON COUNTY PURCHASING DEPARTMENT BID GENERAL REQUIREMENTS
FORM A - NON-COLLUSION AFFIDAVIT OF PRIME BIDDER/OFFEROR
FORM B - NON-COLLUSION AFFIDAVIT OF SUBCONTRACTOR
FORM C - CERTIFICATE OF ACCEPTANCE OF REQUEST FOR BID/PROPOSAL REQUIREMENTS
FORM D – GA UTILITY CONTRACTOR LICENSE (**NOT APPLICABLE**)
FORM E - CERTIFICATION REGARDING DEBARMENT
FORM F - CORPORATE CERTIFICATE
FORM G – DISCLOSURE FORM & QUESTIONNAIRE
00 150 BIDDING SCHEDULE
00 246 COMMUNITY WORKFORCE PROGRAM
00 300 BID FORM
00 301 BID BREAKDOWN FORM
00 430 NON-DISCRIMINATION IN CONTRACTING AND PROCUREMENT
EXHIBIT A – PROMISE OF NON-DISCRIMINATION
EXHIBIT B – EMPLOYMENT RECORD
EXHIBIT C – SCHEDULE OF INTENDED SUBCONTRACTOR UTILIZATION
EXHBIT D – LETTER OF INTENT TO PERFORM AS A SUBCONTRACTOR OR PROVIDE MATERIALS OR SERVICES
EXHIBIT E – DECLARATION REGARDING SUBCONTRACTING PRACTICES
EXHIBIT F – JOINT VENTURE DISCLOSURE AFFIDAVIT
EXHIBIT G – PRIME CONTRACTOR/SUBCONTRACTOR UTILIZATION REPORT
EQUAL BUSINESS OPPORTUNITY PLAN (EBO PLAN)
00 440 OCIP INSURANCE INFORMATION
EXHIBIT H – INSURANCE INFORMATION FORM - CONTRACTOR & SUBCONTRACTOR AGREEMENT

PROJECT MANUAL *(Volume 2 of 2)*

DIVISION 0 CONTRACTING & PROCUREMENT REQUIREMENTS

00 500 OWNER – CONTRACTOR AGREEMENT
Article 1 Contract Documents
Article 2 Administration
Article 3 County
Article 4 Contractor

Article 5 Subcontractors
Article 6 Work By County or By Separate Contractors
Article 7 Miscellaneous Provisions
Article 8 Time
Article 9 Payments and Completion
Article 10 Safety
Article 11 Insurance
Article 12 Changes in the Work
Article 13 Uncovering and Correction of Work
Article 14 Termination of the Contract
Article 15 Non-Discrimination in Contracting & Procurement
Article 16 Full Performance Representation

00 610 BID BOND
00 620 PERFORMANCE & PAYMENT BONDS
00 850 LIST OF DRAWINGS

TECHNICAL SPECIFCATIONS DIVISION 01 – DIVISION 17

DIVISION 1 GENERAL REQUIREMENTS

01 010 SUMMARY OF WORK
01 020 ALLOWANCES
01 025 APPLICATIONS FOR PAYMENT
01 027 UNIT PRICES
01 030 BID ALTERNATES
01 040 PROJECT COORDINATION
01 045 CUTTING, CORING & PATCHING
01 050 LAYOUT OF THE WORK
01 090 REFERENCE STANDARDS
01 200 PROJECT MEETINGS
01 310 SCHEDULING OF THE WORK
01 320 REPORTS
01 340 SHOP DRAWINGS, PRODUCT DATA & SAMPLES
01 370 SCHEDULE OF VALUES
01 400 QUALITY CONTROL
01 500 CONSTRUCTION FACILITIES & TEMPORARY CONTROLS
01 560 ENVIRONMENTAL PROTECTION
01 610 MATERIAL & EQUIPMENT HANDLING
01 630 PRODUCTS & SUBSTITUTIONS
01 680 EQUIPMENT & SYSTEMS INSTRUCTION
01 700 PROJECT CLOSEOUT
01 710 FINAL CLEANING
01 720 PROJECT RECORD DOCUMENTS
01 730 OPERATING & MAINTENANCE DATA
01 740 WARRANTIES
01 760 SPARE PARTS & MAINTENANCE MATERIALS
01 800 SAFETY, HEALTH & LOSS PREVENTION PROGRAM GUIDELINES

01 910 GEOTECHNICAL REPORT

DIVISION 2 SITE CONSTRUCTION

02 110 SITE CLEARING
02 200 EARTHWORK
02 270 EROSION CONTROL
02 282 TERMITE CONTROL
02 510 ASPHALT PAVING
02 520 CONCRETE WALK, PAVING, CURB & GUTTER
02 580 PAVEMENT MARKING
02 601 EXCAVATING, TRENCHING & BACKFILLING FOR UTILITIES
02 610 WATER DISTRIBUTION SYSTEM
02 720 STORM SEWAGE SYSTEM
02 730 SANITARY SEWAGE SYSTEM
02 810 IRRIGATION SYSTEM
02 830 PERMANENT CHAIN LINK FENCE
02 831 ORNAMENTAL METAL FENCING & GATES
02 832 SEGMENTAL RETAINING WALLS
02 900 LANDSCAPE
02 930 LAWNS AND GRASSES
02 950 MAINTENANCE

DIVISION 3 CONCRETE

03 300 CAST-IN-PLACE CONCRETE

DIVISION 4 MASONRY

04 080 MASONRY ANCHORAGE & REINFORCEMENT
04 100 MORTAR AND MASONRY GROUT
04 200 BRICK UNIT MASONRY
04 220 CONCRETE MASONRY UNITS
04 400 ORNAMENTAL STONE

DIVISION 5 METALS

05 120 STRUCTURAL STEEL
05 310 STEEL DECK
05 400 COLD FORMED METAL FRAMING
05 500 METAL FABRICATIONS

DIVISION 6 WOOD AND PLASTICS

06 100 ROUGH CARPENTRY
06 150 WOOD DECKING
06 160 SHEATHING
06 171 WOOD TRUSSES
06 185 STRUCTURAL GLUED-LAMINATED TIMBER
06 402 INTERIOR ARCHITECTURAL WOODWORK

DIVISION 7 THERMAL AND MOISTURE PROTECTION

07 130 SHEET MEMBRANE WATERPROOFING
07 160 BITUMINOUS DAMPPROOFING
07 180 WATER REPELLANTS
07 190 VAPOR RETARDER
07 210 BUILDING INSULATION
07 260 AIR AND MOISTURE BARRIERS
07 270 FIRESTOPPING
07 410 MANUFACTURED ROOF PANELS
07 620 SHEET METAL FLASHING AND TRIM
07 712 MANUFACTURED GUTTER BRACKETS
07 720 ROOF ACCESSORIES
07 920 JOINT SEALANTS

DIVISION 8 DOORS AND WINDOWS

08 110 STEEL DOORS AND FRAMES
08 210 WOOD DOORS
08 330 OVERHEAD COILING GRILLES
08 410 ALUMINUM ENTRANCES & STOREFRONT
08 710 DOOR HARDWARE
08 720 DOOR SCHEDULE
08 800 GLAZING

DIVISION 9 FINISHES

09 220 PORTLAND CEMENT STUCCO
09 260 GYPSUM BOARD ASSEMBLIES
09 300 CERAMIC TILE
09 510 ACOUSTICAL PANEL CEILINGS
09 622 RUBBER RECREATIONAL AND ATHLETIC FLOORING
09 650 RESILIENT FLOORING
09 670 EPOXY RESIN COMPOSTION FLOORING
09 680 CARPET
09 770 FIBER REINFORCED PLASTIC PANELS
09 910 PAINTING

DIVISION 10 SPECIALTIES

10 155 TOILET COMPARTMENTS
10 265 WALL AND CORNER GUARDS
10 305 FIREPLACES
10 350 FLAG POLES
10 400 IDENTIFICATION DEVICES
10 416 DIRECTORIES AND BULLETIN BOARDS
10 522 FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES
10 525 EMERGENCY AID DEVICES
10 810 TOILET ACCESSORIES

DIVISION 11 EQUIPMENT

11 400 FOOD SERVICE EQUIPMENT

DIVISION 12 FURNISHINGS

12 484 FLOOR MATS AND FRAMES
12 491 HORIZONTAL LOUVER BLINDS
12 494 ROLLER SHADES

DIVISION 13 SPECIAL CONSTRUCTION

(NOT USED)

DIVISION 14 CONVEYING SYSTEMS

(NOT USED)

DIVISION 15 MECHANICAL

15 010 MECHANICAL GENERAL
15 060 PIPING, VALVES & SPECIALTIES
15 180 INSULATION
15 400 PLUMBING
15 500 FIRE PROTECTION
15 650 HEATING, VENTILATION AND AIR CONDITIONING
15 800 DUCTWORK AND AIR DISTRIBUTION
15 900 AUTOMATIC CONTROLS
15 990 TEST, ADJUST & BALANCE
15 995 MECHANICAL COMMISSIONING REQUIREMENTS
15 997 MECHANICAL TESTING REQUIREMENTS
15 998 PREFUNCTIONAL CHECKLIST – MECHANICAL & ELECTRICAL

DIVISION 16 ELECTRICAL

16 010 GENERAL
16 100 BASIC MATERIALS & METHODS
16 400 ELECTRICAL SERVICE AND DISTRIBUTION EQUIPMENT
16 450 GROUNDING
16 460 DRY-TYPE TRANSFORMERS
16 500 LIGHTING FIXTURES
16 720 FIRE ALARM SYSTEM
16 750 MISCELLANEOUS SYSTEMS
16 973 SECURITY SYSTEM
16 995 ELECTRICAL SYSTEMS COMMISSIONING
16 997 ELECTRICAL TESTING REQUIREMENTS

DIVISION 17 SUPPLEMENTAL

17 200 COMMISSIONING REQUIREMENTS

END OF TABLE OF CONTENTS

SECTION 00 500 OWNER – CONTRACTOR AGREEMENT

AGREEMENT:

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:

Fairburn Neighborhood Senior Center

The Work:

IFB Number: 06ITB 49976K-RS
Contract Name: Fairburn Neighborhood Senior Center

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:

Tony Pope
A Vincent Pope + Associates Inc.
2015 Montreal Road
Suite 200
Tucker, Georgia 30084-5224

TABLE OF CONTENTS

ARTICLE 1 CONTRACT DOCUMENTS

1.1 Definitions
1.2 Execution, Correlation and Intent
1.3 Ownership and Use of Documents
1.4 Assembly of Construction Drawings and Specifications Prior to Notice to Proceed

ARTICLE 2 ADMINISTRATION

2 1 Construction Manager
2.2 The Architect
2.3 Administration of the Contract

ARTICLE 3 COUNTY

3.1 Definition
3.2 Information and Services Required of the County
3.3 County's Right to Stop the Work
3.4 County's Right to Carry out the Work

ARTICLE 4 CONTRACTOR

4.1 Definition
4.2 *(not used)*
4.3 Review of Contract Documents and Field Conditions By the `Contractor
4.4 Supervision and Construction Procedures
4.5 Labor and Materials
4.6 Warranty
4.7 Taxes
4.8 Permits, Fees and Notices
4.9 Allowances
4.10 Superintendent
4.11 Contractor's Design and Construction Schedule
4.12 *(not used)*
4.13 Documents and Samples At the Site
4.14 Shop Drawings, Product Data and Samples
4.15 Use of Site
4.16 Cutting and Patching / Existing Structures and Utilities
4.17 Cleaning Up
4.18 Communications
4.19 Copyright, Royalties and Patents
4.20 Indemnification

Table of Contents Continued

ARTICLE 5 SUBCONTRACTORS

5.1 Definitions
5.2 Sub-contractual Relations
5.3 Awards of Subcontracts

ARTICLE 6 WORK BY COUNTY OR BY SEPARATE CONTRACTORS

6.1 County's Right to Perform Work and to Award Separate Contracts
6.2 Mutual Responsibility
6.3 County's Right to Clean Up

ARTICLE 7 MISCELLANEOUS PROVISIONS

7.1 Governing Law & Forum Selection
7.2 Successors and Assigns
7.3 Written Notice
7.4 Claims for Damages
7.5 Performance Bond and Labor and Material Payment Bond
7.6 Rights and Remedies
7.7 Tests and Inspections
7.8 Interest
7.9 Work Performance & Conduct
7.10 Severablity
7.11 Force Majeure

ARTICLE 8 TIME

8.1 Definitions
8.2 Contract Time Limits
8.3 Damages for Late Completion
8.4 Delays and Extensions of Time

ARTICLE 9 PAYMENTS AND COMPLETION

9.1 Contract Sum
9.2 Schedule of Values
9.3 Payments
9.4 Applications for Payment
9.5 Certificates for Payment
9.6 Payments Withheld
9.7 Substantial Completion
9.8 Final Completion and Final Payment

Table of Contents Continued

ARTICLE 10 SAFETY

10.1 Contractor's Safety Program
10.2 Designation of Safety Representative
10.3 County's Safety Program Guidelines
10.4 Compliance of Work, Equipment, and Procedures With All Laws
10.5 Protection of the Work
10.6 Safety Equipment
10.7 Emergencies
10.8 Suspension of the Work
10.9 Contractor's Indemnity of the County for Contractor's Non-Compliance With Safety Program

ARTICLE 11 INSURANCE

11.1 Owner-Controlled Insurance Program
11.2 Contractor's Liability Insurance
11.3 Loss of Use Insurance

ARTICLE 12 CHANGES IN THE WORK

12.1 Change Orders
12.2 Concealed Conditions
12.3 Requests for Additional Cost
12.4 Minor Changes In the Work

ARTICLE 13 UNCOVERING AND CORRECTION OF WORK

13.1 Uncovering of Work
13.2 Correction of Work
13.3 Acceptance of Defective of Nonconforming Work

ARTICLE 14 TERMINATION OF THE CONTRACT

14.1 Termination for Default
14.2 Termination for Convenience of the County
14.3 Termination Provisions

ARTICLE 15 NON-DISCRIMINATION IN CONTRACTING & PROCUREMENT

ARTICLE 16 FULL PERFORMANCE REPRESENTATION

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.

****

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.

****

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.

****

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.

****

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.

****

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.

****

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.

****

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.

****

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.

****

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 form 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 111.3.4(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

Each Accident	GA Statutory Limits
Disease – Policy Limit	$ 500,000
Disease – Each Employee	$ 100,000
Employers Liability	$ 1,000,000

General Liability

Bodily Injury/Property Damage	$ 1,000,000
Personal Injury	$ 1,000,000
General Aggregate	$ 2,000,000

Business Automobile Liability

Bodily Injury	$ 1,000,000 CLS

Excess/Umbrella

(In excess of noted coverages)
Each Occurrence $2,000,000

Professional Liability (if required by the specific Contract and Project)

Limit of $1,000,000 or 10% of Contract value, whichever is greater.

Electronic Data Processing Liability
(Required if computer contractor) Limits $1,000,000

Fidelity Bond
(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	$100,000
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.

****

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.

****

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.

****

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 or 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 be 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.

_____
**[Name of person signing for vendor]*

_____
**[Title of person signing]*

(seal)

Attest:

_____
(Signature)

_____
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:

_____
Willie A. Hopkins, Jr., Director
General Services Department

Approved as to Form:

_____
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 49976K-RS FAIRBURN NEIGHBORHOOD SENIOR CENTER
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 49976K-RS FAIRBURN NEIGHBORHOOD SENIOR CENTER,** 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

_____ BY_____
(SEAL)

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 Invitation to Bid documents.

Dwg. No.	Drawing Title	Issue Date	Latest Rev. No.	Revision Date
	COVER SHEET	2.16.05	1	4.06.06
A1.0	INDEX + GENERAL NOTES	2.16.05		
CIVIL DRAWINGS				
C1.0	COVER SHEET	2.16.05		
C1.1	SURVEY PLAN	2.16.05		
C2.0	SITE PLAN	2.16.05		
C3.0	GRADING PLAN	2.16.05		
C3.0A	GRADING PLAN	4.06.06	1	4.06.06
C4.0	EROSION CONTROL PLAN	2.16.05		
C4.0A	INITIAL EROSION CONTROL PLAN	4.06.06	1	4.06.06
C4.1	FINAL EROSION CONTROL PLAN	2.16.05		
C4.1A	INTERMEDIATE/FINAL EROSION CONTROL PLAN	4.06.06	1	4.06.06
C5.0	PIPING PLAN	2.16.05		
C6.0	LANDSCAPE/TREE PROTECTION PLAN	2.16.05		
L1.0	LANDSCAPE/TREE PROTECTION PLAN	4.06.06	1	4.06.06
C6.1	IRRIGATION PLAN	2.16.05		
IR1.0	IRRIGATION PLAN	4.06.06	1	4.06.06
C7.0	EROSION CONTROL DETAIL SHEET	2.16.05		
C8.0	MISCELLANEOUS DETAIL SHEET	2.16.05		
C8.1	MISCELLANEOUS DETAIL SHEET	2.16.05		
C9.0	PROFILES	2.16.05		
C10.0	SEWER EXTENSION PLAN	2.16.05		
C11.0	BAYSAVER OIL/WATER DETAILS	2.16.05		
STRUCTURAL DRAWINGS				
S1.0	GENERAL NOTES	2.16.05	1	4.06.06
S2.0	FOUNDATION PLAN	2.16.05		
S2.1	ROOF FRAMING PLAN	2.16.05		
S3.1	TYPICAL FOUNDATION DETAILS	2.16.05		
S4.1	TYPICAL ROOF FRAMING DETAILS	2.16.05		
S5.1	BRACING ELEVATIONS	2.16.05		
LIFE SAFETY DRAWINGS				
LS1.0	LIFE SAFETY PLAN	2.16.05		
ARCHITECTURAL DRAWINGS				
A1.1	PARTITION TYPES + DETAILS	2.16.05		
A1.2	DOOR + FRAME SCHEDULE/DETAILS	2.16.05		
A2.0	ARCHITECTURAL SITE PLAN	2.16.05	1	4.06.06
A2.1	FLOOR PLAN + DETAILS	2.16.05	1	4.06.06
A2.2	ROOF PLAN + DETAILS	2.16.05	1	4.06.06
A2.3	REFLECTED CEILING PLAN + DETAILS	2.16.05	1	4.06.06

A3.0	BUILDING SECTIONS	2.16.05		
A3.1	BUILDING ELEVATIONS	2.16.05	1	4.06.06
A3.2	WALL SECTIONS + DETAILS	2.16.05	1	4.06.06
A3.3	WALL SECTIONS + DETAILS	2.16.05	1	4.06.06
A3.4	WALL SECTIONS + DETAILS	2.16.05	1	4.06.06
A3.5	NOT USED			
A3.6	ORNAMENTAL STONE DETAILS	2.16.05		
A3.7	WINDOW SCHEDULE + DETAILS	2.16.05	1	4.06.06
A3.8	ROOF DETAILS	2.16.05	1	4.06.06
A3.9	PORCH LAYOUT + DETAILS	2.16.05		
A4.0	ENLARGED PLANS	2.16.05		
INTERIOR DRAWINGS				
ID1.0	FLOOR FINISH PLAN	2.16.05	1	4.06.06
ID1.1	WALL FINISH PLAN	2.16.05	1	4.06.06
ID1.2	SIGNAGE PLAN	2.16.05	1	4.06.06
ID1.3	FURNITURE PLAN (FOR REFERENCE ONLY)	2.16.05		
ID1.4	TILE PATTERN PLANS	2.16.05	1	4.06.06
ID1.5	INTERIOR ELEVATIONS	2.16.05	1	4.06.06
ID1.6	INTERIOR ELEVATIONS	2.16.05	1	4.06.06
ID1.7	MILLWORK DETAILS	2.16.05	1	4.06.06
ID1.8	MILLWORK DETAILS	2.16.05	1	4.06.06
KITCHEN DRAWINGS				
K1.0	KITCHEN FLOOR PLAN	2.16.05		
K2.0	KITCHEN EQUIPMENT SCHEDULE	2.16.05		
K3.1	KITCHEN PLUMBING PLAN	2.16.05		
K3.2	KITCHEN FLOOR SLOPE PLAN	2.16.05		
K4.1	KITCHEN CONNECTION ELECTRICAL PLAN	2.16.05		
K5.1	KITCHEN VENTILATION PLAN	2.16.05		
MECHANICAL DRAWINGS				
M1.0	HVAC PLAN	2.16.05	1	4.06.06
M2.0	SCHEDULE + DETAILS	2.16.05		
ELECTRICAL DRAWINGS				
E1.0	LEGEND AND NOTES	2.16.05		
E1.1	KITCHEN POWER PLAN	2.16.05		
E2.0	LIGHTING PLAN	2.16.05		
E3.0	SYSTEMS PLAN	2.16.05		
E4.0	POWER PLAN	2.16.05		
E5.0	ELECTRICAL SITE PLAN	2.16.05		
E5.1	SITE LIGHTING CALCULATIONS	2.16.05		
PLUMBING DRAWINGS				
P1.0	PLUMBING PLAN	2.16.05		
P2.0	KITCHEN PLUMBING PLANS	2.16.05		
P3.0	PLUMBING SCHEDULES + DETAILS	2.16.05		
FIRE PROTECTION DRAWINGS				
FP1.0	PLUMBING PLAN	2.16.05		

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: 66 Brooks Drive
Building A
Fairburn, Georgia 30213-1336

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 11,500 square foot Neighborhood Senior Center to serve the Fairburn area. The site is a wooded, vacant lot. The building is conventional construction consisting of a slab on grade, light structural framing, brick, stone and glass 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

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 01 Owners Allowance

a. Allowance amount: $200,000.00

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.

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, APPLICTIONS 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 lost, 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 _____

_____ By: _____
Notary Public *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. ACCEPANCE 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 incor76porated 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 requirements for horizontal window blinds as specified in Section 12 491 Horizontal Louver Blinds and SUBSTITUTE with Roller Shades as manufactured by Mecco Shades. Typical of 23 units. Roller shades shall be mounted between window mullions, manual operation, chain drive with visually transparent single-fabric shadecloth. Refer to specification section 12 494 Roller Shades for specific product requirements.

B. Bid Alternate No. 2: ADD a one year Landscape Maintenance Contract as specified in section 02 950 Maintenance to the project scope of work.

C. Bid Alternate No. 3: DELETE chain link fencing requirements as indicated on project drawing "a2.0" detail "4" and SUBSTITUTE ornamental metal fencing as specified on 02 831 Ornamental Metal Fencing and Gates, and defined on drawing "a2.0".

D. Bid Alternate No. 4: DELETE requirements for underground detention system as indicated on project drawing C3.0, Initial Erosion Control Plan indicated on project drawing C4.0, Final Erosion Control Plan indicated on project drawing C4.1, Landscape /Tree Protection Plan indicated on project drawing C6.0 and Irrigation Plan indicated on project drawing C6.1 and SUBSTITUTE new project drawings C3.0A Grading Plan, C4.0A Initial Erosion Control Plan, C4.1A Intermediate/Final Erosion Control Plan, L1.0 Landscape Tree Protection Plan and IR1.0 Irrigation Plan.

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
21. 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

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, of 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.I 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 ¾ 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 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. INITIAL PRODUCT SUBMISSION

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.

3. 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.

4. 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: Substitutions will only be considered for the reasons noted 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. 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.

5. SUBMITTAL PROCEDURES ON SUBSTITUTIONS

A. Substitution Request Form: The 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 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.

6.0 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 Form (three pages) attached

SUBSTITUTION REQUEST FORM
A. *For Use Only After Contract Award*

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

From: _____

To: Vincent Pope + Associates, Inc.

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 01 710 – 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 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.

****

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 1st 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 stops 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/manufacturer 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 Subsurface Exploration and Geotechnical Engineering Evaluation (29 pages)
Piedmont Geotechnical Consulting, Inc. February 22, 2003

END OF SECTION 01 910 – GEOTECHNICAL REPORT

Report of Subsurface Exploration and
Geotechnical Engineering Evaluation
Proposed Fairburn Regional Health and Senior Center
U.S. 29 at Brooks Drive
Fulton County, Georgia
PGC Project No. 203037

PIEDMONT
GEOTECHNICAL CONSULTANTS, INC.

P.O. BOX 1997 * ROSWELL, GA 30077
(770) 752-9205 * FAX (770) 752-0890

February 22, 2003

Fulton County General Services Department
Land Division
141 Pryor Street, SW
Suite 8021
Atlanta, Georgia 30303

Attention: Mr. Van C. Johnson
Deputy Land Administrator

Subject: **Report of Subsurface Exploration and Geotechnical Engineering Evaluation**
Proposed Fairburn Regional Health and Senior Center
U.S. 29 at Brooks Drive
Fulton County, Georgia
PGC Project No. 203037

Gentlemen:

Piedmont Geotechnical Consultants, Inc., is pleased to provide this report of our subsurface exploration and geotechnical engineering evaluation for the referenced project. The field study and this report were accomplished in general accordance with PGC Proposal No. P3017, dated January 10, 2003.

The following report will present a brief summary of our pertinent findings and recommendations followed by our understanding of the proposed construction, methods of exploration employed, site and subsurface conditions encountered, and conclusions and recommendations regarding the geotechnical aspects of the project. Should you have any question regarding items discussed in this report, please do not hesitate to contact the undersigned.

Sincerely,
Piedmont Geotechnical Consultants, Inc.

Kevin A. Burnette /RD
Kevin A. Burnette
Staff Geologist

Robin D. Bell
Robin D. Bell, P.E.
Senior Registered Engineer

TABLE OF CONTENTS

SECTION — PAGE NUMBER

1.0 SUMMARY 4

2.0 PROPOSED CONSTRUCTION 4

3.0 METHODS OF EXPLORATION 5

4.0 SITE DESCRIPTION, GEOLOGY AND SUBSURFACE CONDITIONS 5
4.1 Site Description 5
4.2 Geology 6
4.3 Subsurface Conditions 6

5.0 CONCLUSIONS AND RECOMMENDATIONS 6
5.1 General 6
5.2 Site Preparation 7
5.3 Earthwork 7
5.4 Difficult Excavations 8
5.5 Groundwater Control 9
5.6 Foundations 9
5.7 Soil Supported Slabs 10
5.8 Temporary and Permanent Slopes 10

6.0 QUALIFICATION OF RECOMMENDATIONS 10

APPENDIX

Soil Test Boring Procedures
Correlation with Standard Penetration Test Results
Boring Location Plan
Soil Test Boring Logs (15)

1.0 SUMMARY

The following is a brief summary of our pertinent findings and recommendations. The reader is referred to the remaining text of this report for elaboration on these items.

1. The property appears generally suitable for the proposed construction, from a geotechnical standpoint.

2. General subsurface conditions consist of a 2- to 12-inch surficial topsoil layer underlain by moderate consistency residual soils. Partially weathered rock and refusal was encountered at boring B-4 within the northwestern portion of the site at a depth of 9 ½ feet. An additional boring offset 9 feet away was extended to a depth of 20 feet. Partially weathered rock or rock was not encountered at the remaining boring locations.

3. Groundwater was encountered within borings B-1, B-4, B-8, and B-9 at depths of 11 to 15 feet. Provided final grades are maintained at least 8 feet above these measured groundwater levels, groundwater is not anticipated to significantly impact site development. Excavations that extend to within a few feet of or below these depths could encounter groundwater.

4. The structures may be supported by conventional shallow foundations, bearing on residual soil or structural fill, using a net allowable bearing pressure of 3000 psf.

5. The on-site soils are visually suitable for reuse as structural fill. Some moisture conditioning (e.g. drying) may be required.

6. Excavations to the planned depths can be accomplished using conventional heavy earthmoving equipment. Some difficult excavation conditions may be experienced in the vicinity of B-4.

2.0 PROPOSED CONSTRUCTION

The approximate 3.7-acre site will be developed to accommodate a Regional Health and Senior Center. The building has not been sited, but is anticipated to be located within the central portion of the site. A grading plan has not been provided; however, we anticipate that excavations will be made within the central portions of the site with the northwestern portions of the site filled to achieve final grades. We anticipate maximum cuts and fills on the order of 5 feet or less to achieve final grades. We have assumed maximum column loads on the order of 50 kips or less and wall loads on the order of 2 kips per linear foot or less. We anticipate that the building will be a one-story structure with soil supported ground floor slabs.

No other details of the proposed construction were available at the time this report was prepared.

3.0 METHODS OF EXPLORATION

To evaluate the subsurface conditions, the property was explored by a combination of a visual site reconnaissance and drilling fifteen (15) soil test borings to depths of 20 feet below the existing grade. The borings were located in the field by measuring distances and estimating directions from identifiable site features. Therefore, their locations as shown on the Boring Location Plan in the Appendix, should be considered approximate.

The borings were advanced by twisting continuous hollow stem auger flights into the ground. At selected intervals, Standard Penetration Resistance Testing (SPT) was performed in general accordance with ASTM standard D-1586, and soil samples were collected for visual classification. The results of the penetration tests, when properly evaluated, provide an indication of the relative consistency of the soil being sampled, the potential for difficult excavation, and the soil's ability to support loads. A more detailed description of the drilling and sampling process is included in the Appendix of this report.

Soil samples recovered during the drilling process were returned to the office where they were classified in general accordance with the Unified Soil Classification System (USCS). Detailed descriptions of the materials encountered at each boring location, along with a graphical representation of the Standard Penetration Test results, are shown on the Soil Boring Records, in the Appendix. No topographic information was provided; therefore, ground surface elevations are not shown on the boring records.

4.0 SITE DESCRIPTION, GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Site Description

The site is located in the west corner formed by the intersection of U.S. 29 and Brooks Drive in Fairburn, Georgia. The site is comprised of two tracts. Tract "A" consists of 3.1 acres and is bound to the southeast by U.S. 29 and Brooks Drive to the northeast. A gravel drive for the adjacent cemetery extends along the southwest edge of Tract "A" and through Tract "B". Tract "A" is covered with a few mature hardwoods and pines with dense second growth trees. Remnants (e.g. concrete slabs, masonry blocks, etc.) for two residences that once occupied Tract "A" were observed within the southern and central portions of the site. Tract "B" is grassed with the exception of the gravel drive. An overhead powerline extends along Brooks Drive along the northeast side of the site and turns extending through the northern portions of the site. The site is comprised of a ridge that extends through the site in a southeast to northwest direction. From this ridge, the site slopes gradually downward to the northeast and southwest/west.

4.2 Geology

The site is located in the Piedmont Physiographic Province of Georgia. The residual soils in the Piedmont are the result of the chemical and physical weathering of the underlying parent rock. The weathering profile usually results in fine grained clayey silts and silty clays near the surface, where weathering is more advanced. With depth, sandy silts and silty sands are found, often containing mica. Below the residual soils, partially weathered rock is often found as a transition above relatively unweathered rock. In local practice, partially weathered rock is arbitrarily defined as residual soils with Standard Penetration Resistances in excess of 100 blows per foot (50 blows per 6 inches), and which can be penetrated by a power auger.

4.3 Subsurface Conditions

The general subsurface conditions encountered consist of a 2- to 12-inch surficial layer of topsoil. We note that the surficial topsoil layer was partially removed from the boring locations during the clearing activities with an end loader to provide drill rig access. During these clearing activities, the topsoil layer was observed to be about 6 inches thick. The topsoil was underlain by moderate consistency residual soils. These residual soils consisted of multi-colored sandy silts and silty sands with varying amounts of clay and mica and exhibited Standard Penetration Tests (SPT) results ranging from 6 to 48 blows per foot (bpf). Boring B-4 encountered partially weathered rock and refusal at a depth of 9 ½ feet. An offset boring performed 9 feet away was extended to a depth of 20 feet without encountering refusal. The initial refusal likely occurred on a boulder. The remaining borings were extended to their planned termination depths of 20 feet below the existing ground surface without encountering partially weathered rock or rock.

Groundwater was encountered in borings B-1, B-4, B-8, and B-9 at depths of 11 to 15 feet. Groundwater was not encountered at the remaining boring locations. We note that groundwater levels will fluctuate with yearly and seasonal climatic variations and may be encountered at higher elevations in the future.

The conditions described in the preceding paragraphs, and those shown in the Appendix, have been based on interpolation of the results of the previously described data using generally accepted principles and practices of geotechnical engineering. However, conditions in this geology may vary intermediate of the tested locations.

Although individual soil test borings are representative of the subsurface conditions at the precise boring locations on the day drilled, they are not necessarily indicative of the subsurface conditions at other locations or other times. The nature and extent of variation between the borings may not become evident until the course of construction. If such variations are then noted, it will be necessary to reevaluate the recommendations of this report after on-site observation of the conditions.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on the data gathered during this exploration, our understanding of the proposed construction, our experience with similar site and subsurface conditions and generally accepted principles and practices of geotechnical engineering. Should the proposed construction change significantly from that described in this report, we request that we be advised so that we may amend these recommendations accordingly. This report, and the conclusions and recommendations provided herein, are provided exclusively for the use of Fulton County General Services Department and is intended solely for design of the referenced project.

5.1 General

The site is suitable for the proposed construction, from a geotechnical standpoint. We recommend that the structures be supported on conventional shallow foundations, utilizing a net allowable bearing pressure of 3000 ksf. The on-site soils are suitable for reuse as structural fill and we anticipate that planned excavations can be accomplished using conventional heavy earthmoving equipment. Measured groundwater levels should be taken into account when establishing final grades. Final grades should be maintained at least 8 feet above measured groundwater levels if feasible.

5.2 Site Preparation

As an initial step in site preparation, all trees and unwanted vegetation should be removed, stumps grubbed and organic topsoil stripped. Special attention should be given to remove the existing foundations, slabs, septic tanks, and other previous construction related to the residences that previously occupied the site. Following stripping, all at grade areas and areas to receive fill should be evaluated prior to fill placement. The approval process should include proofrolling the subgrade with a fully loaded tandem axle dump truck (20 tons) during a period of dry weather and under the observation of the geotechnical engineer. Any areas which "pump" or "rut" excessively under the weight of the proofrolling vehicle should be further evaluated, and may require undercutting or other remediation. The proofrolling can occasionally detect pits where stumps or other debris may have been buried, or other areas where weak surface conditions exist.

5.3 Earthwork

The residual soils on the property visually appear suitable for reuse as structural fill. Moisture control may be necessary, primarily depending on the weather conditions at the time of construction.

All structural fill should be compacted to at least 95 percent of the soil's standard Proctor maximum dry density, as determined by ASTM standard D-698. The upper foot of fill which will support pavements or slabs should be compacted to at least 98 percent of the soil's standard Proctor maximum dry density for improved support. In areas which are at or above the finished grade, and which will support pavements or slabs, the upper 8 inches immediately below these systems should be scarified and recompacted to the 98 percent criteria. Structural fill should be free of organic

material, have a plasticity index (PI) less than 20 and contain rock sizes no larger than 4 inches.

Density testing should be performed by a soils technician to determine the degree of compaction and verify compliance with the project specifications. For underfloor areas, at least one field density test should be made per 5000 square feet of fill area for each two-foot lift. Testing frequency should be increased in confined areas. Areas which do not meet the compaction specifications should be recompacted to achieve compliance. In confined areas, such as utility trenches, the use of portable compaction equipment and thin lifts of 3 to 4 inches may be required to achieve compaction.

5.4 Difficult Excavations

Refusal was encountered at boring B-4 at a depth of 9 ½ feet. An additional boring performed 9 feet away was extended to a depth of 20 feet without encountering refusal. The initial refusal is anticipated to have resulted from a boulder. Some difficult excavations, however, may be encountered in the vicinity of this boring.

In mass excavations, partially weathered rock generally requires loosening prior to its removal with conventional earthmoving equipment. Loosening generally consists of pulling a large single tooth hydraulic ripper attached to a Caterpillar D-8K dozer, or equivalent equipment. In general, partially weathered rock with penetration resistances of 50 blows for more than 2 inches of penetration should be considered rippable for planning purposes. Partially weathered rock with penetration resistances of 50 blows for 2 inches or less penetration may require blasting to aid in removal.

In confined excavations, such as utility trenches and footings, excavation of partially weathered rock will require large backhoes, pneumatic spades or light blasting.

At the base of partially weathered rock , or in some cases residual soil, relatively unweathered rock will be encountered. Some of this rock may be ripped if sufficient joints and fractures are present. However, for planning purposes, we would anticipate that all partially weathered rock with SPT results of 50 blows per 2 inches or less penetration, and unweathered rock, will require blasting to facilitate removal.

The definition of rock for excavation purposes can be a source of conflict during construction. The following definitions have been successfully incorporated into specifications on other projects and are provided for your general guidance.

GENERAL EXCAVATION

Rip Rock: Any material that cannot be removed by scrapers, loaders, pans, dozers, or graders; and requires loosening by using a single-tooth ripper mounted on a crawler tractor having a minimum draw bar pull rated at not less than 56,000 pounds.

Blast Rock: Any material which cannot be excavated after loosening with a single-tooth ripper mounted on a crawler tractor having a minimum draw bar pull rated at not less than 56,000 pounds (Caterpillar D-8K or equivalent) or by a Caterpillar 973 front-end loader or equivalent; and occupying an original volume of at least one (1) cubic yard.

TRENCH EXCAVATION

Blast Rock: Any material which cannot be excavated with a backhoe having a bucket curling force rated at not less than 25,700 pounds (Caterpillar Model 225 or equivalent) and occupying an original volume of at least one-half (1/2) cubic yard.

The contractor should exercise extreme caution when blasting near the proposed finished grade or in localized blasting for individual footings. If blasting damages soil, partially weathered rock, or rock which is to support foundations or slabs, the damaged material should be removed.

5.5 Groundwater Control

Groundwater was encountered within four borings within the central and northern portions of the site at depths of 11 to 15 feet. We currently anticipate maximum excavations in these areas to be limited to 5 feet or less; therefore, we do not anticipate that groundwater will significantly impact site grading. If excavations extend to within a few feet of or below these measured groundwater levels, temporary and/or permanent dewatering may be necessary.

5.6 Foundations

We recommend that the structures be supported on conventional shallow foundations bearing on the existing residual soil or new structural fill. A design bearing pressure of 3000 psf is recommended. The recommended bearing pressure is based on correlations with the Standard Penetration Test results. These correlations imply that a maximum total settlement of one inch is possible and a maximum differential settlement of half the total settlement is possible. Minimum foundation widths of 24 inches and 18 inches are recommended for individual column and strip footings, respectively, to preclude the possibility of localized soil bearing failures. Exterior foundations should bear at least 18 inches below external grades to prevent frost damage.

As with any construction, all foundation excavations should be evaluated by a geotechnical engineer, who will verify that the design bearing pressure is available intermediate of boring locations, and that foundations are not immediately underlain by worse conditions. If the engineer finds localized conditions of weak or organic soil below an individual footing, it should be undercut or a lower bearing pressure used, depending upon the actual conditions found.

5.7 Soil Supported Slabs

Floor slabs may be soil supported, subject to the subgrade preparation and earthwork recommendations contained in this report. Crushed stone is not needed to support the slab loads and is considered optional.

5.8 Temporary and Permanent Slopes

Permanent and temporary slopes may be used to accommodate grade changes. If temporary slopes are used, they should be constructed no steeper than 1.5H:1V for slopes less than 15 feet high. Permanent slopes should be constructed no steeper than 2H:1V. These recommendations are based on our experience with similar conditions and no detailed slope stability analyses have been performed. Buildings should be set back at least 10 feet from the top of slopes; a minimum 5 foot setback is considered sufficient for pavement areas. All finished slopes should be suitably protected from erosion.

6.0 QUALIFICATIONS OF RECOMMENDATIONS

This evaluation of the geotechnical aspects of the proposed design and construction has been based on our understanding of the project and the data obtained during this study. The general subsurface conditions used in our evaluation were based on interpolation of the subsurface data between the borings. Regardless of the thoroughness of a subsurface exploration, there is the possibility that conditions will differ between boring locations, that conditions are not as anticipated by the designers, or that the construction process has modified the soil conditions. Therefore, experienced soil engineers and technicians should evaluate earthwork and foundation construction to verify that the conditions anticipated in design actually exist. Otherwise, we assume no responsibility for construction compliance with the design concepts, specifications or recommendations.

The recommendations contained in this report have been developed on the basis of the previously described project characteristics and subsurface conditions. If project criteria change, we should be permitted to determine if the recommendations should be modified. The findings of such a review will be presented in a supplemental report. Even after completion of a subsurface study, the nature and extent of variation between borings may not become evident until the course of construction. If such variations then become evident, it will be necessary to reevaluate the recommendations of this report after on-site observations of the conditions.

These professional services have been performed, the findings derived, and recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all warranties either expressed or implied. This company is not responsible for the conclusions, opinions or recommendations of others based on these data.

APPENDIX

SOIL TEST BORING PROCEDURES (ASTM D-1586)

The soil test borings were advanced by twisting continuous auger flights into the ground. At selected intervals, soil samples were obtained by driving a standard 1.4 inch I.D., 2.0 inch O.D., split tube sampler into the ground. The sampler was initially seated six inches to penetrate any loose cuttings created in the boring process. The sampler is then driven an additional 12 inches by blows of a 140 pound "hammer" falling 30 inches. The number of blows required to drive the sampler the final foot is designated the Standard Penetration Resistance.

The samples recovered were sealed in glass jars and were transported to the office where they were classified by an engineer in general accordance with the Unified Soil Classification System (USCS).

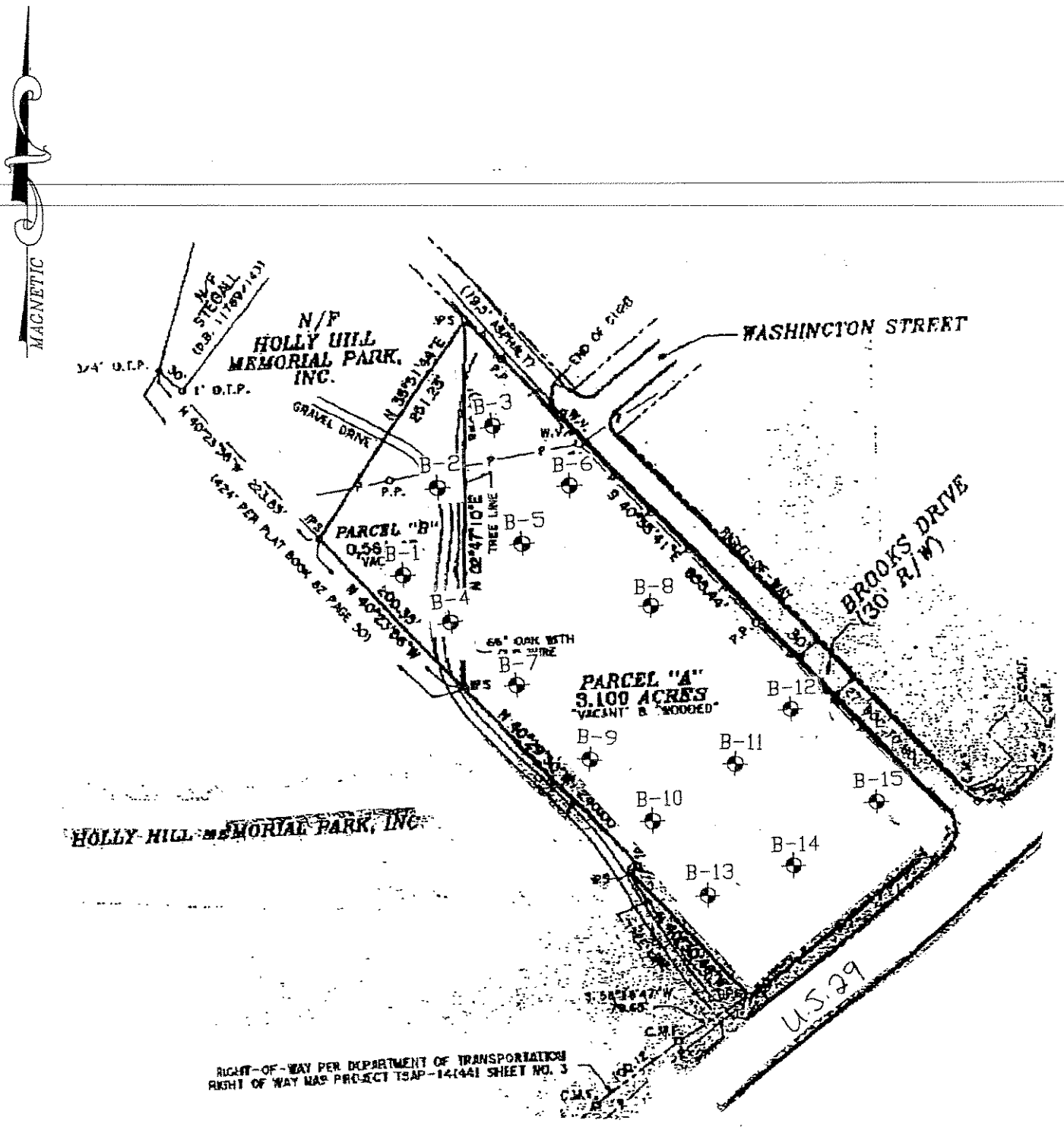
CORRELATION OF STANDARD PENETRATION RESISTANCE WITH RELATIVE COMPACTNESS AND CONSISTENCY

Sand and Gravel

Standard Penetration Resistance Blows / Foot	Relative Compactness
0 - 4	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
30 - 50	Dense
Over 50	Very Dense

Silt and Clay

Standard Penetration Resistance Blows / Foot	Relative Compactness
0 - 1	Very Soft
2 - 4	Soft
5 - 8	Firm
9 - 15	Stiff
16 - 30	Very Stiff
31 - 50	Hard
Over 50	Very Hard



BORING LOCATION PLAN

LEGEND:

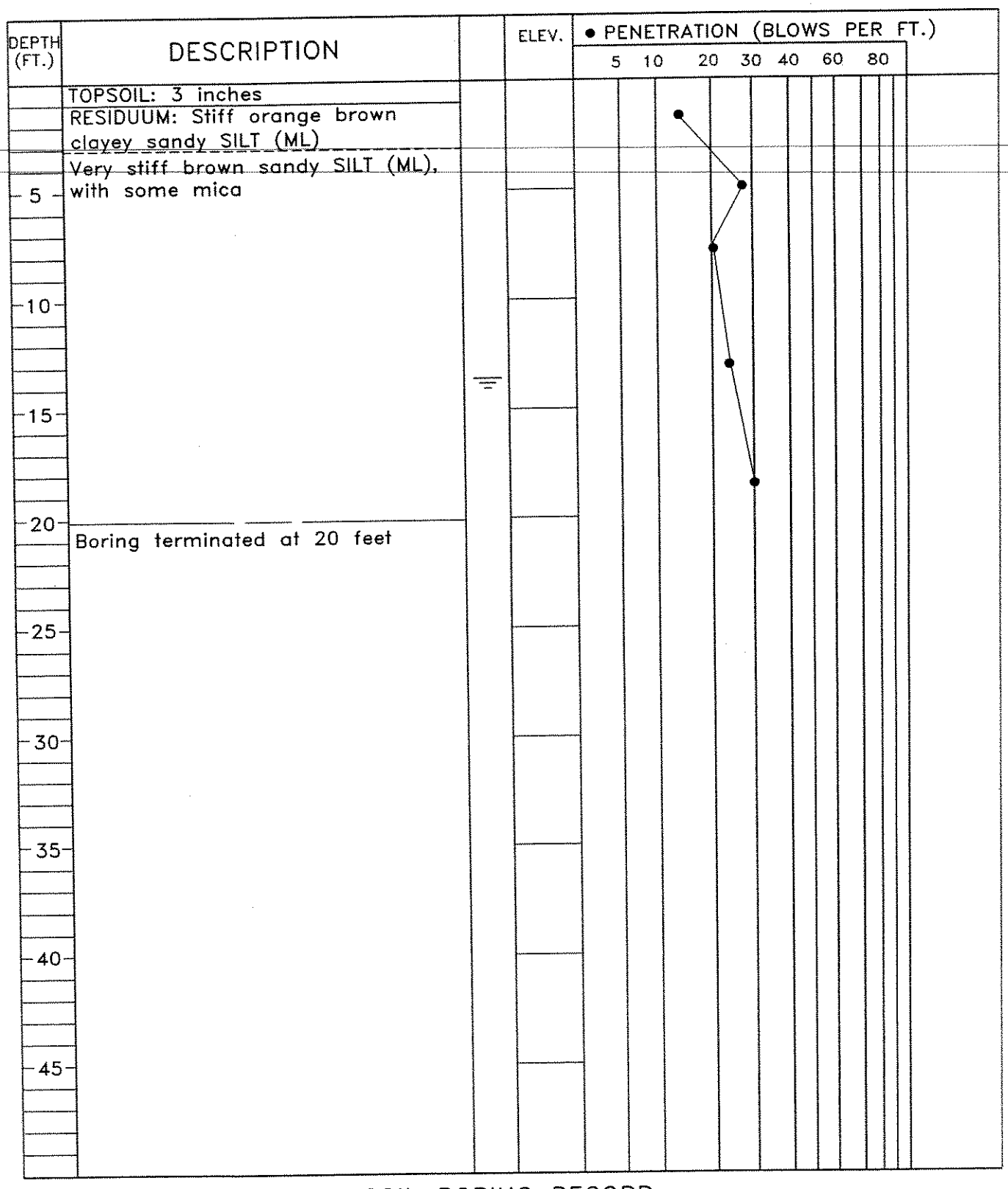
⌖ SOILTEST BORING

SCALE: NTS

PIEDMONT
GEOTECHNICAL CONSULTANTS, INC.
145 Andrew Drive, Suite 100
Stockbridge, Georgia 30281
678-289-0766

FAIRBURN REGIONAL HEALTH
AND SENIOR CENTER
FAIRBURN, GEORGIA
PGC PROJECT NO. 203037

PIEDMONT GEOTECHNICAL CONSULTANTS, INC.



SOIL BORING RECORD

BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113
PENETRATION IS THE NUMBER OF BLOWS OF 140 LBS.HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

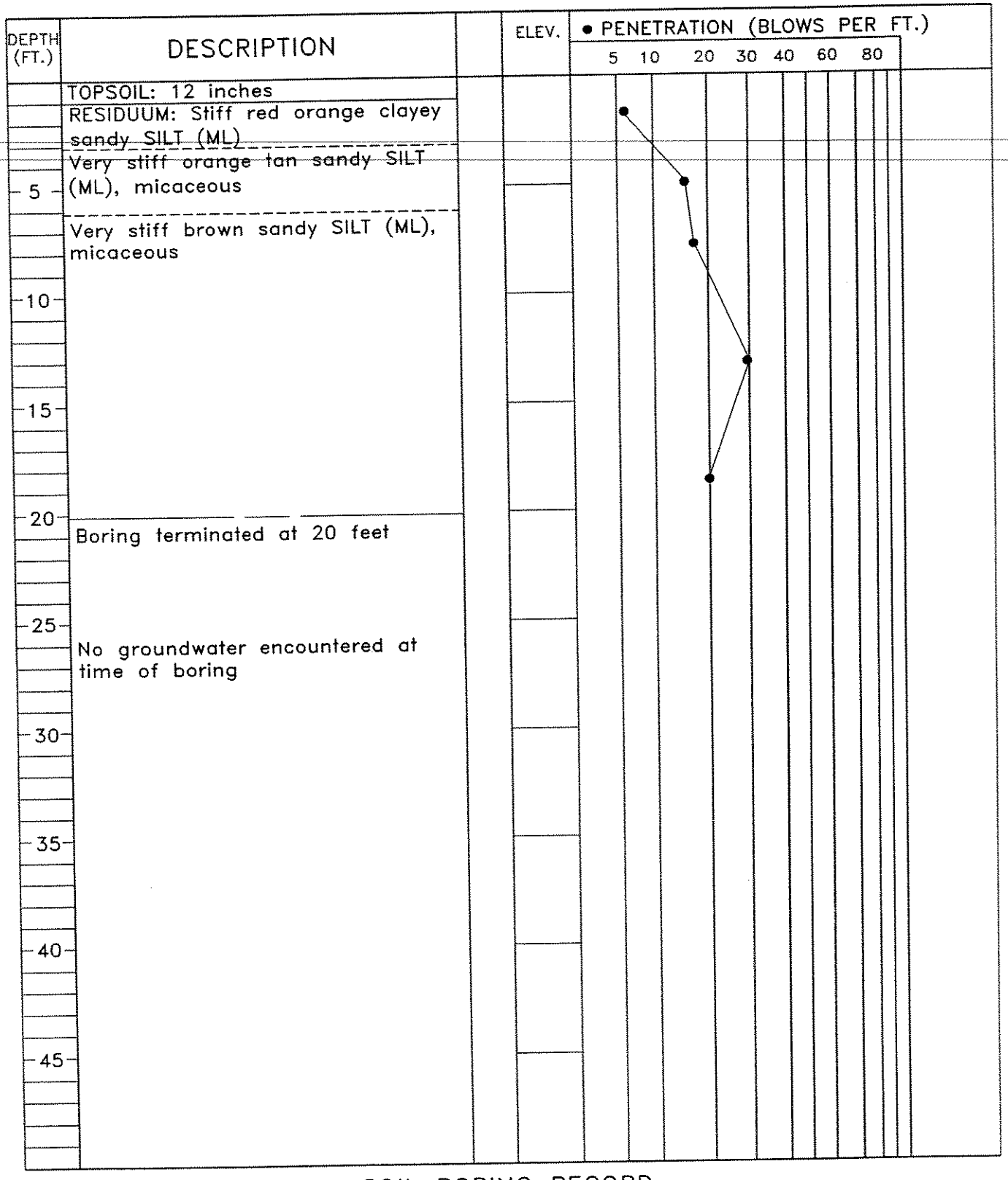
C CAVED DEPTH – 24 HRS. ▽ GROUNDWATER LEVEL – 24 HRS.

UNDISTURBED SAMPLE ▽ GROUNDWATER LEVEL AT TIME OF BORING

(XX) – DENOTES UNIFIED SOIL CLASSIFICATION SYSTEM

BORING NO. B-1
DATE DRILLED 2/18/03
JOB NO. 203037
PAGE 1 OF 1

PIEDMONT GEOTECHNICAL CONSULTANTS, INC.



SOIL BORING RECORD

BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113
PENETRATION IS THE NUMBER OF BLOWS OF 140 LBS.HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

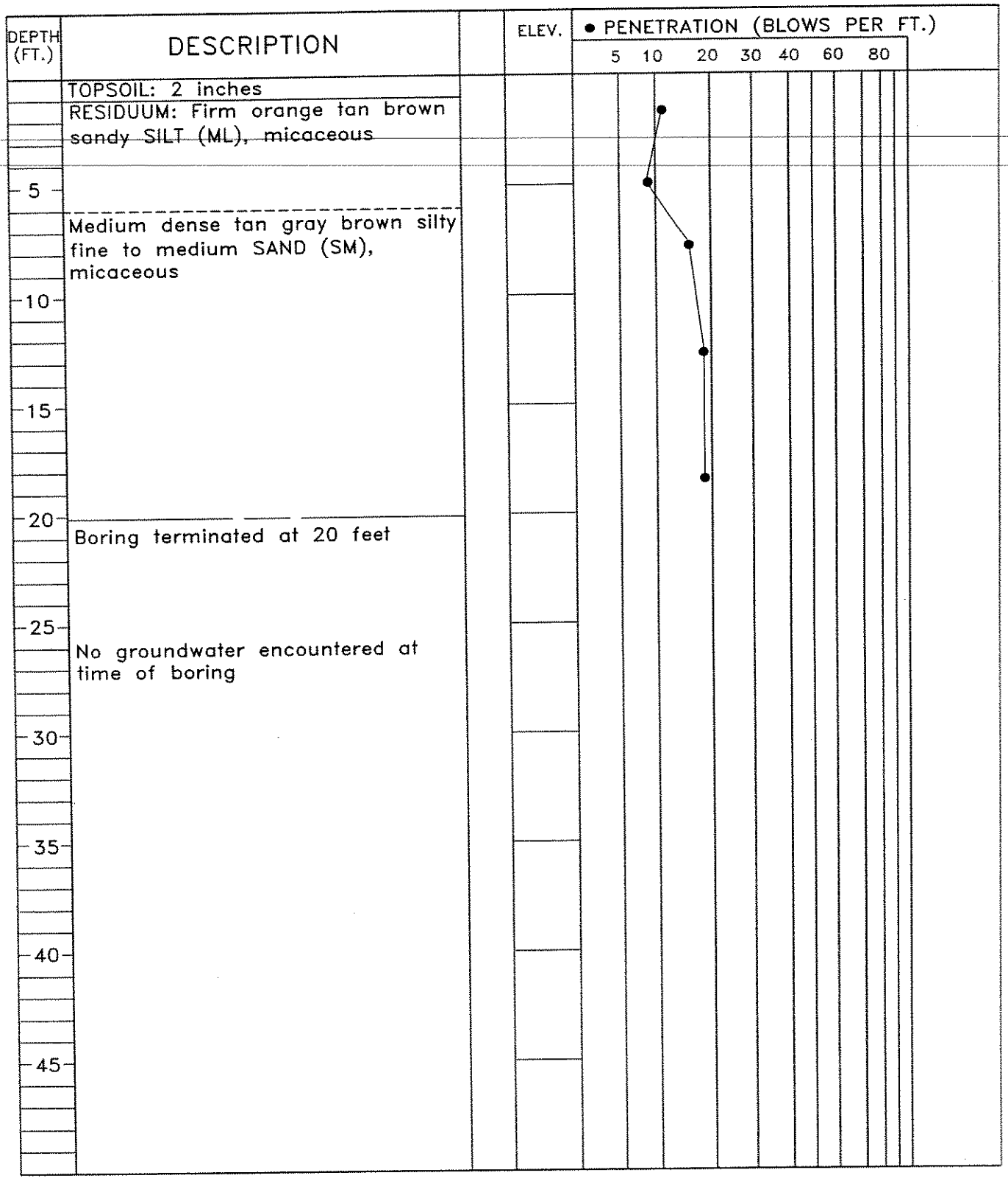
C CAVED DEPTH - 24 HRS. ▽ GROUNDWATER LEVEL - 24 HRS.

▮ UNDISTURBED SAMPLE ▽ GROUNDWATER LEVEL AT TIME OF BORING

(XX) - DENOTES UNIFIED SOIL CLASSIFICATION SYSTEM

BORING NO. B-2
DATE DRILLED 2/18/03
JOB NO. 203037
PAGE 1 OF 1

PIEDMONT GEOTECHNICAL CONSULTANTS, INC.



SOIL BORING RECORD

BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113
PENETRATION IS THE NUMBER OF BLOWS OF 140 LBS.HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

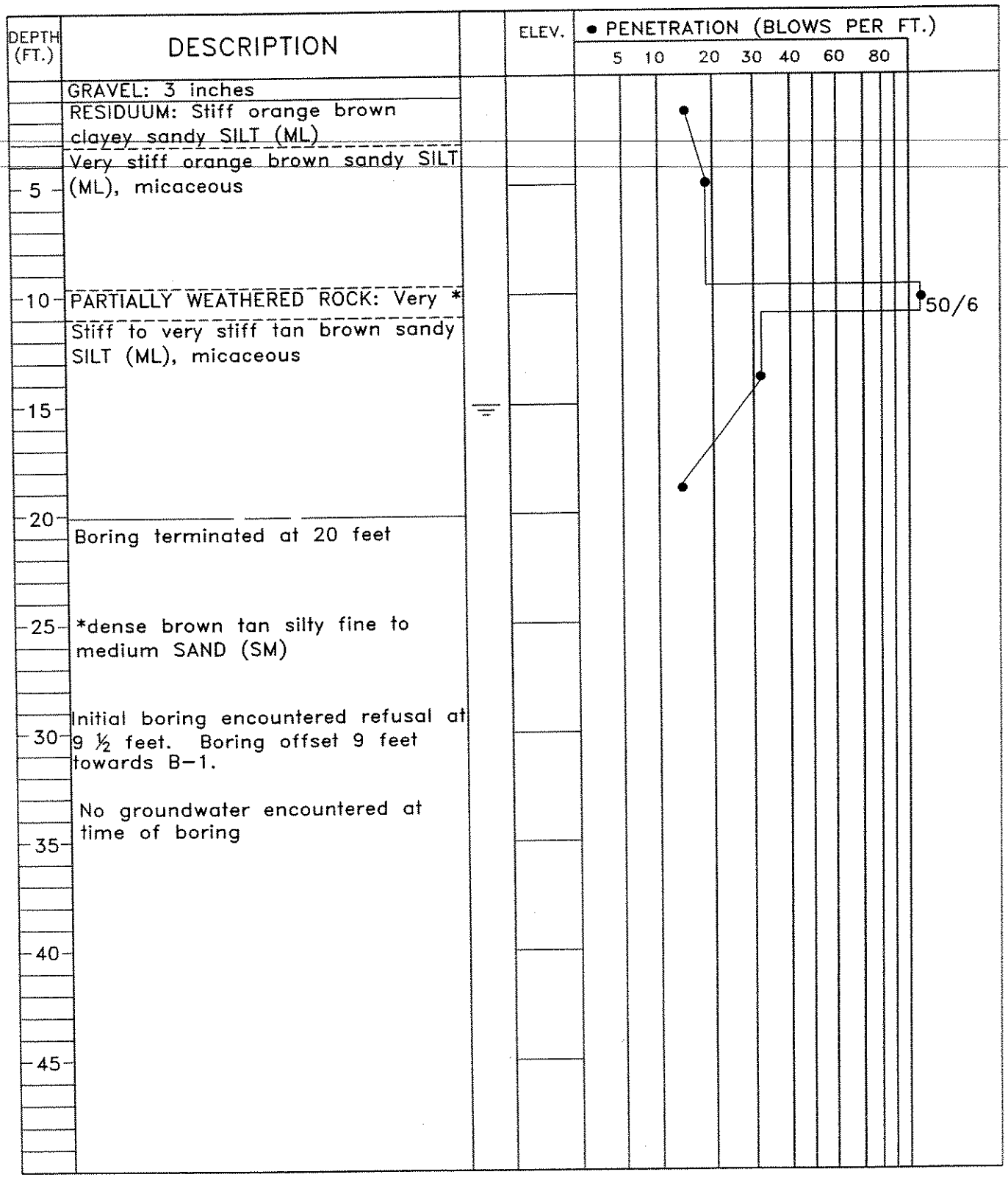
C CAVED DEPTH - 24 HRS. ▽ GROUNDWATER LEVEL - 24 HRS.

▮ UNDISTURBED SAMPLE ▽ GROUNDWATER LEVEL AT TIME OF BORING

(XX) - DENOTES UNIFIED SOIL CLASSIFICATION SYSTEM

BORING NO. B-3
DATE DRILLED 2/18/03
JOB NO. 203037
PAGE 1 OF 1

PIEDMONT GEOTECHNICAL CONSULTANTS, INC.



SOIL BORING RECORD

BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113
PENETRATION IS THE NUMBER OF BLOWS OF 140 LBS.HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

C CAVED DEPTH – 24 HRS. ▽ GROUNDWATER LEVEL – 24 HRS.

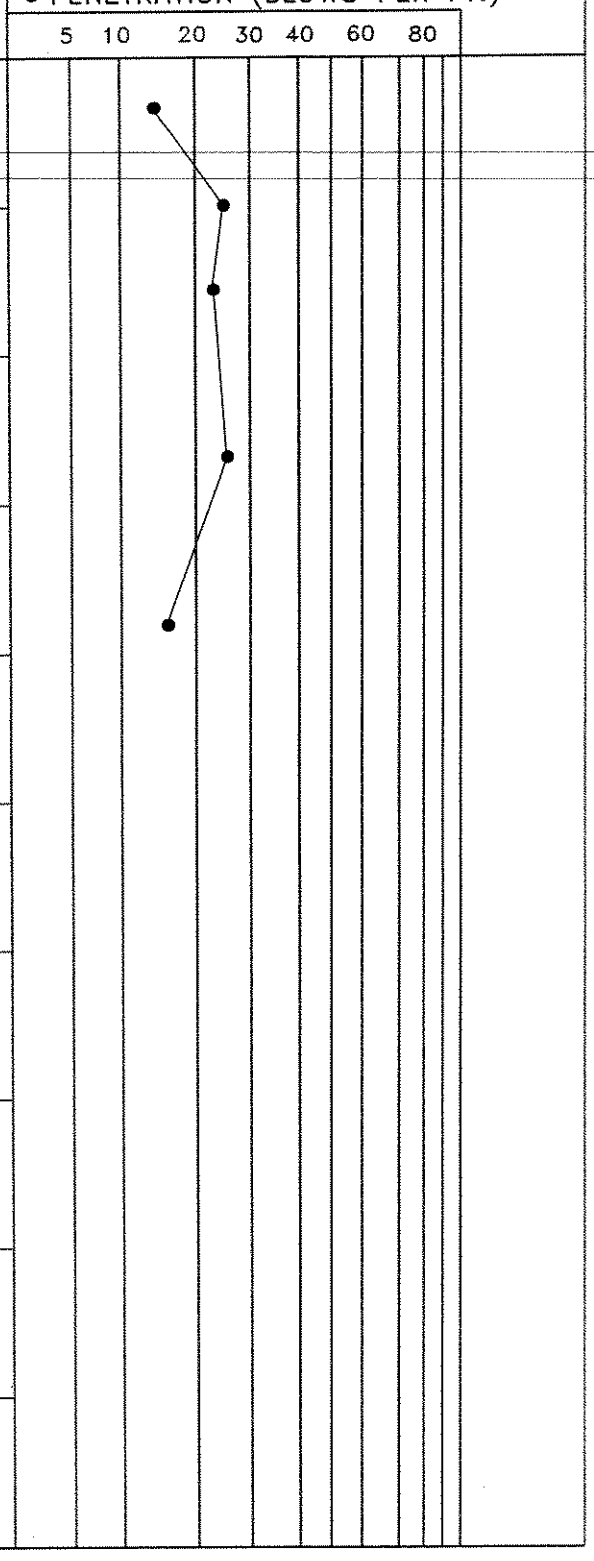
UNDISTURBED SAMPLE ▽ GROUNDWATER LEVEL AT TIME OF BORING

(XX) – DENOTES UNIFIED SOIL CLASSIFICATION SYSTEM

BORING NO. B-4
DATE DRILLED 2/18/03
JOB NO. 203037
PAGE 1 OF 1

PIEDMONT GEOTECHNICAL CONSULTANTS, INC.

DEPTH (FT.)	DESCRIPTION	ELEV.
	TOPSOIL: 2 inches	
	RESIDUUM: Firm red orange clayey sandy SILT (ML)	
5	Very stiff red brown sandy SILT (ML)	
	Medium dense tan gray white silty fine to medium SAND (SM)	
10		
15		
20	Boring terminated at 20 feet	
25	No groundwater encountered at time of boring	
30		
35		
40		
45		



SOIL BORING RECORD

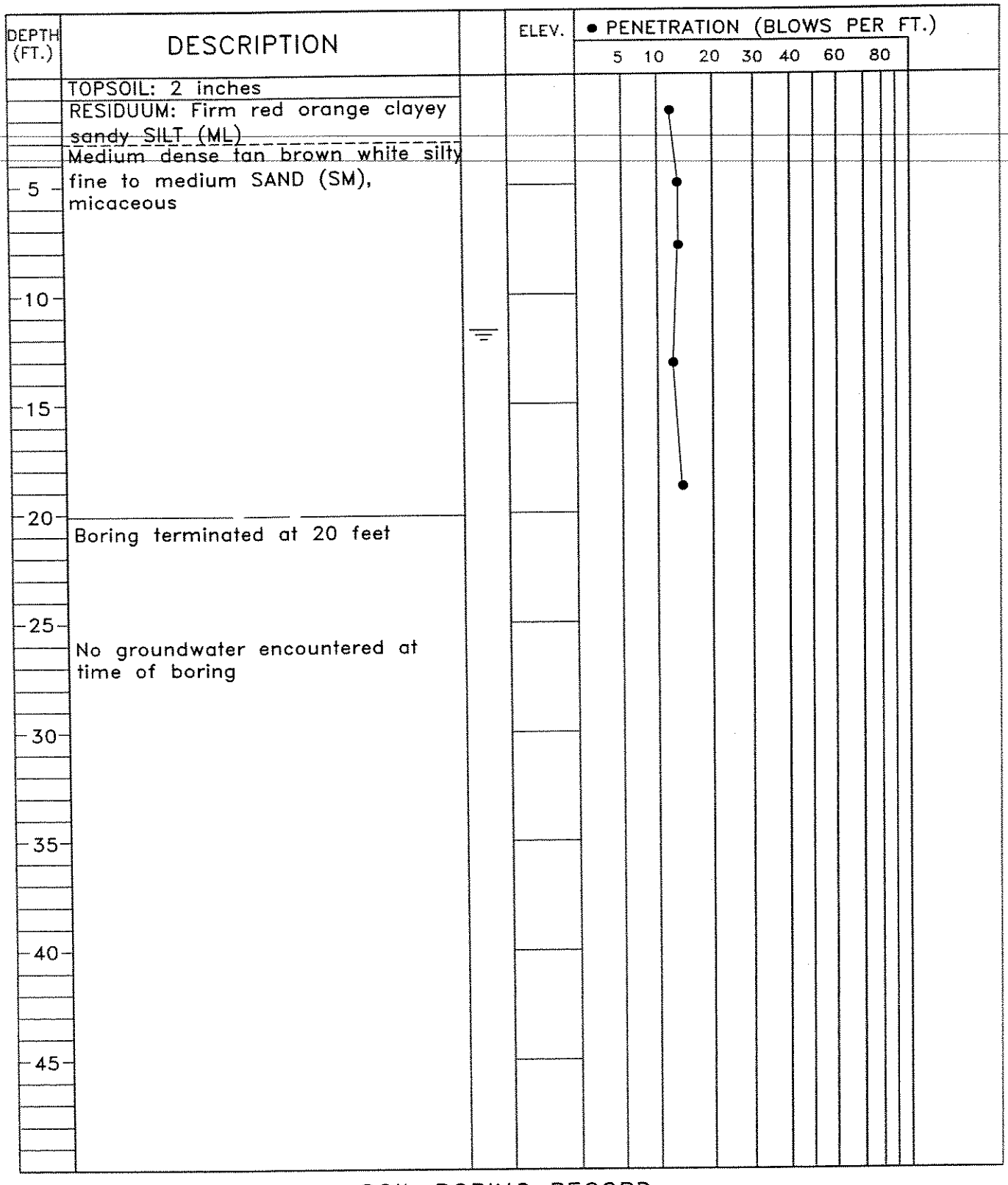
BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113
PENETRATION IS THE NUMBER OF BLOWS OF 140 LBS.HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

C CAVED DEPTH - 24 HRS. ▽ GROUNDWATER LEVEL - 24 HRS.
▮ UNDISTURBED SAMPLE ▽ GROUNDWATER LEVEL AT TIME OF BORING

(XX) - DENOTES UNIFIED SOIL CLASSIFICATION SYSTEM

BORING NO. B-5
DATE DRILLED 2/18/03
JOB NO. 203037
PAGE 1 OF 1

PIEDMONT GEOTECHNICAL CONSULTANTS, INC.



SOIL BORING RECORD

BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113
PENETRATION IS THE NUMBER OF BLOWS OF 140 LBS.HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

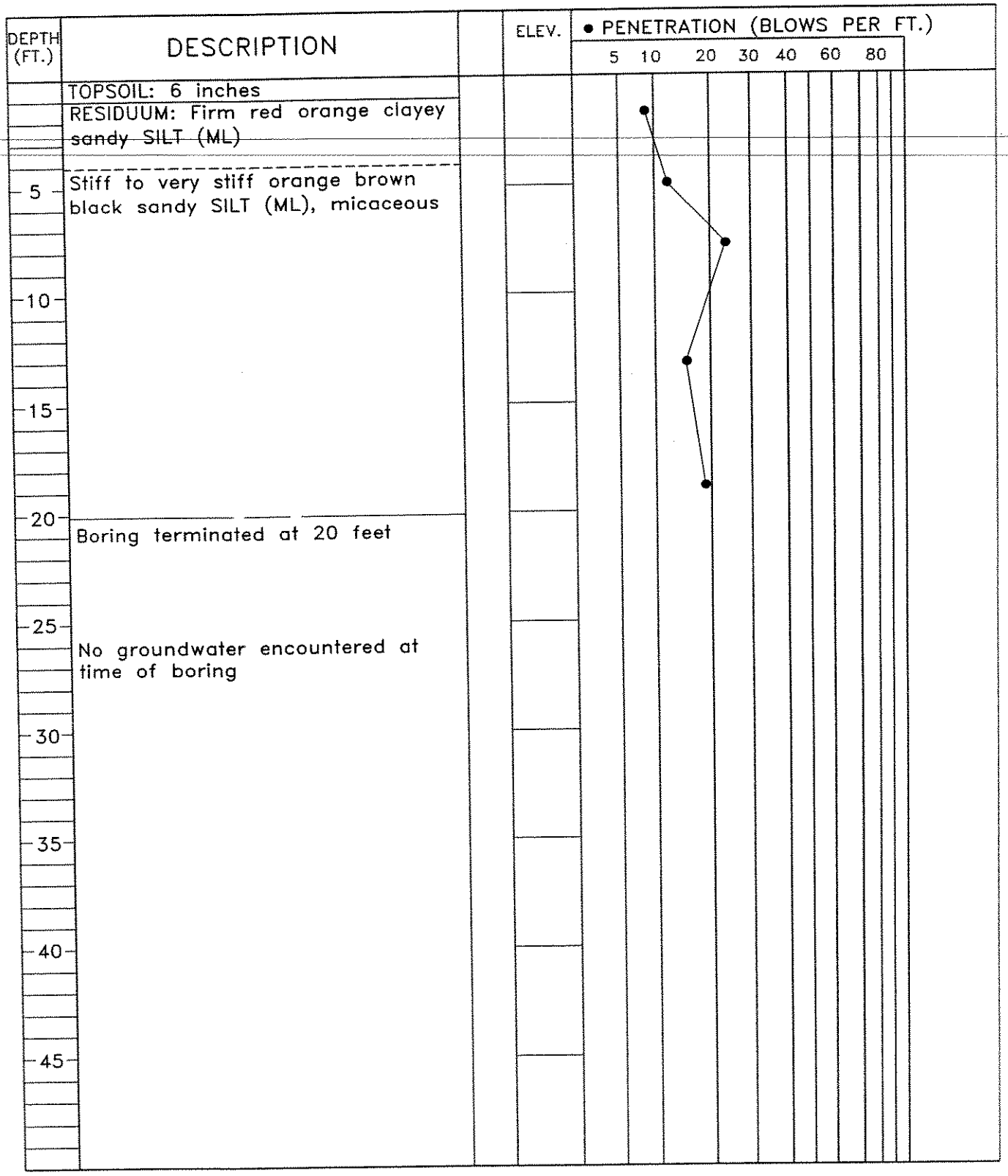
C CAVED DEPTH - 24 HRS. ▽ GROUNDWATER LEVEL - 24 HRS.

▮ UNDISTURBED SAMPLE ▽ GROUNDWATER LEVEL AT TIME OF BORING

(XX) - DENOTES UNIFIED SOIL CLASSIFICATION SYSTEM

BORING NO. B-6
DATE DRILLED 2/18/03
JOB NO. 203037
PAGE 1 OF 1

PIEDMONT GEOTECHNICAL CONSULTANTS, INC.



SOIL BORING RECORD

BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113
PENETRATION IS THE NUMBER OF BLOWS OF 140 LBS.HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

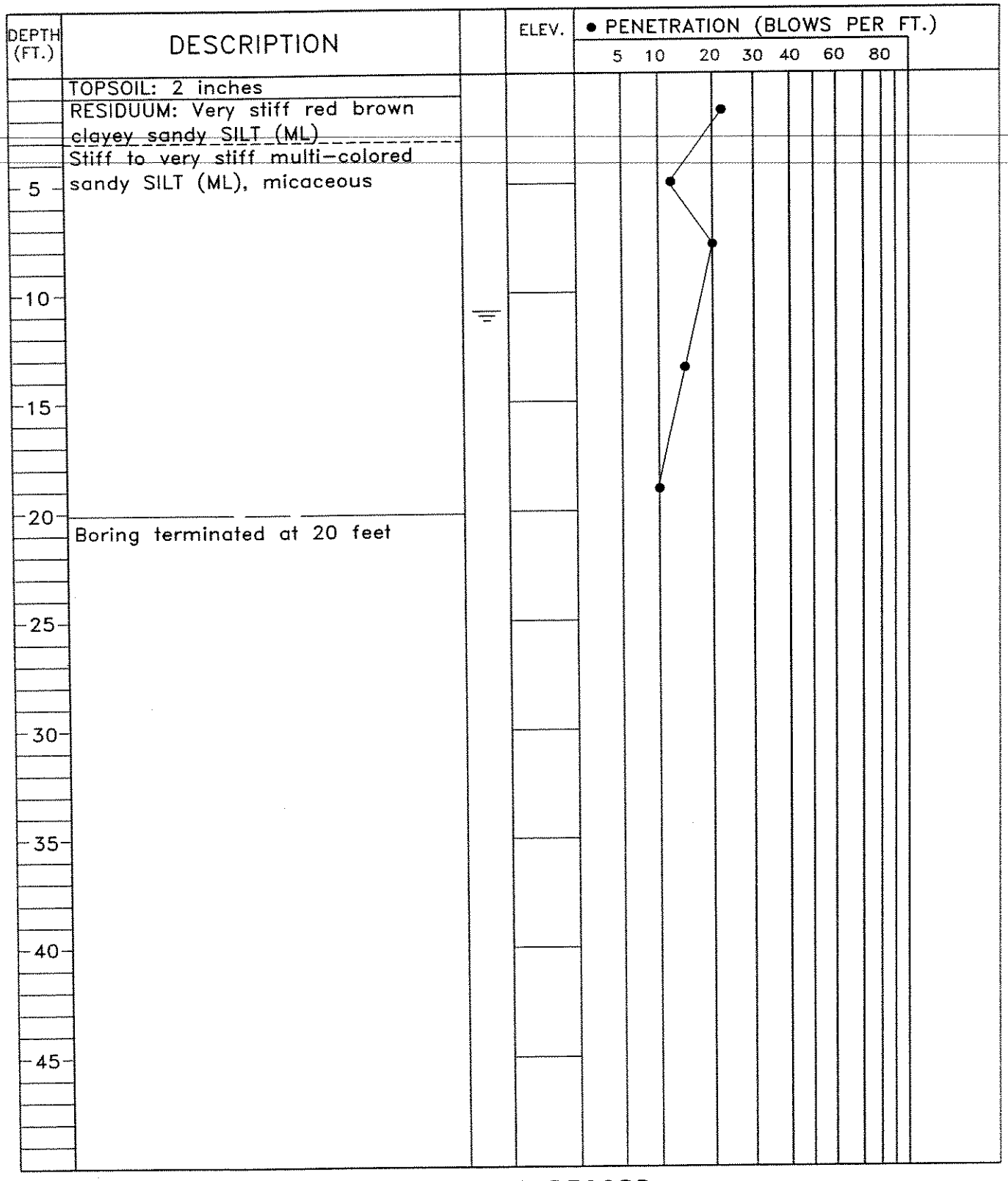
C CAVED DEPTH - 24 HRS. ▽ GROUNDWATER LEVEL - 24 HRS.

▮ UNDISTURBED SAMPLE ▽ GROUNDWATER LEVEL AT TIME OF BORING

(XX) - DENOTES UNIFIED SOIL CLASSIFICATION SYSTEM

BORING NO. B-7
DATE DRILLED 2/18/03
JOB NO. 203037
PAGE 1 OF 1

PIEDMONT GEOTECHNICAL CONSULTANTS, INC.



SOIL BORING RECORD

BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113
PENETRATION IS THE NUMBER OF BLOWS OF 140 LBS.HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

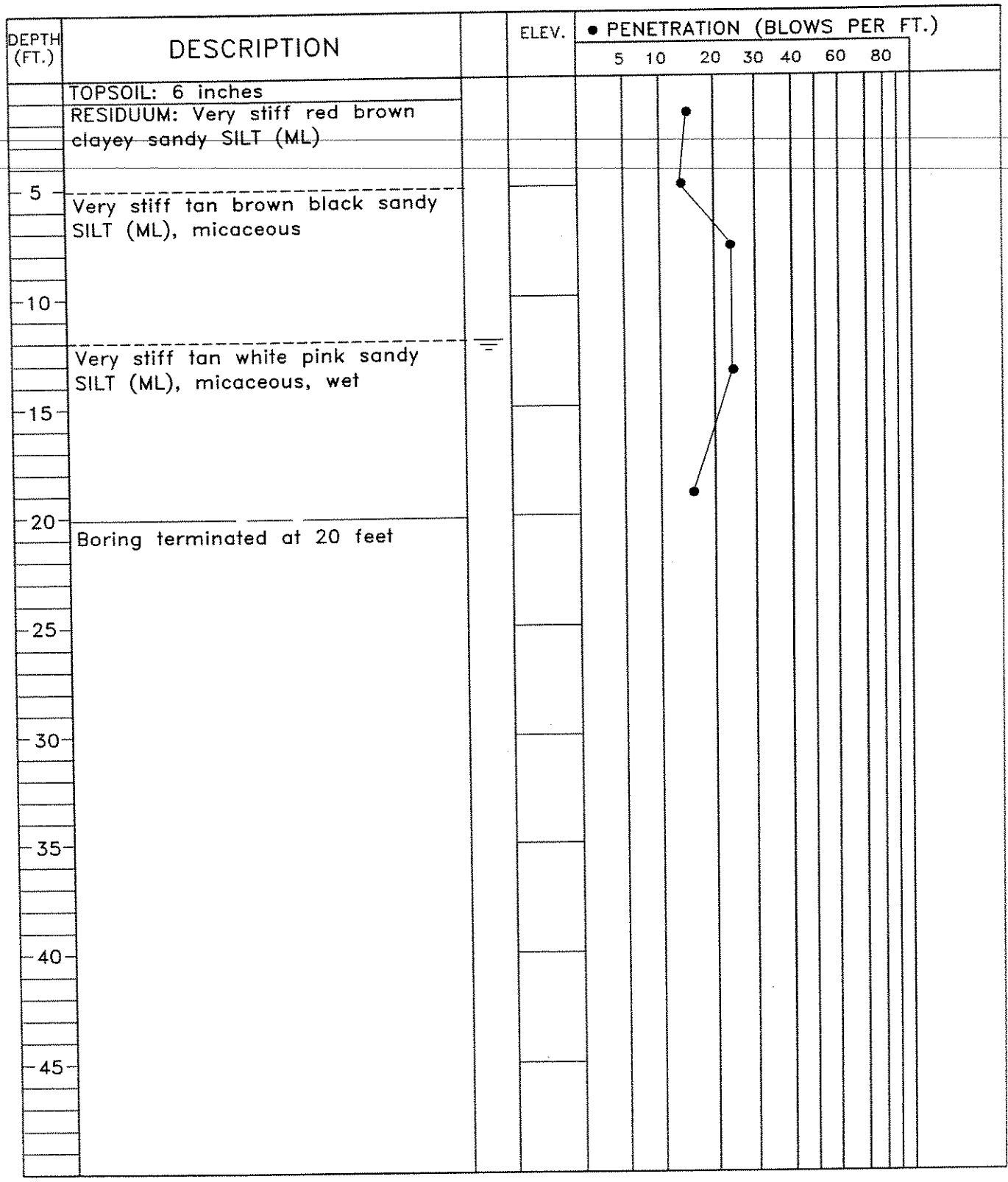
C CAVED DEPTH - 24 HRS. ▽ GROUNDWATER LEVEL - 24 HRS.

▮ UNDISTURBED SAMPLE ▽ GROUNDWATER LEVEL AT TIME OF BORING

(XX) - DENOTES UNIFIED SOIL CLASSIFICATION SYSTEM

BORING NO. B-8
DATE DRILLED 2/18/03
JOB NO. 203037
PAGE 1 OF 1

PIEDMONT GEOTECHNICAL CONSULTANTS, INC.



SOIL BORING RECORD

BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113
PENETRATION IS THE NUMBER OF BLOWS OF 140 LBS.HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

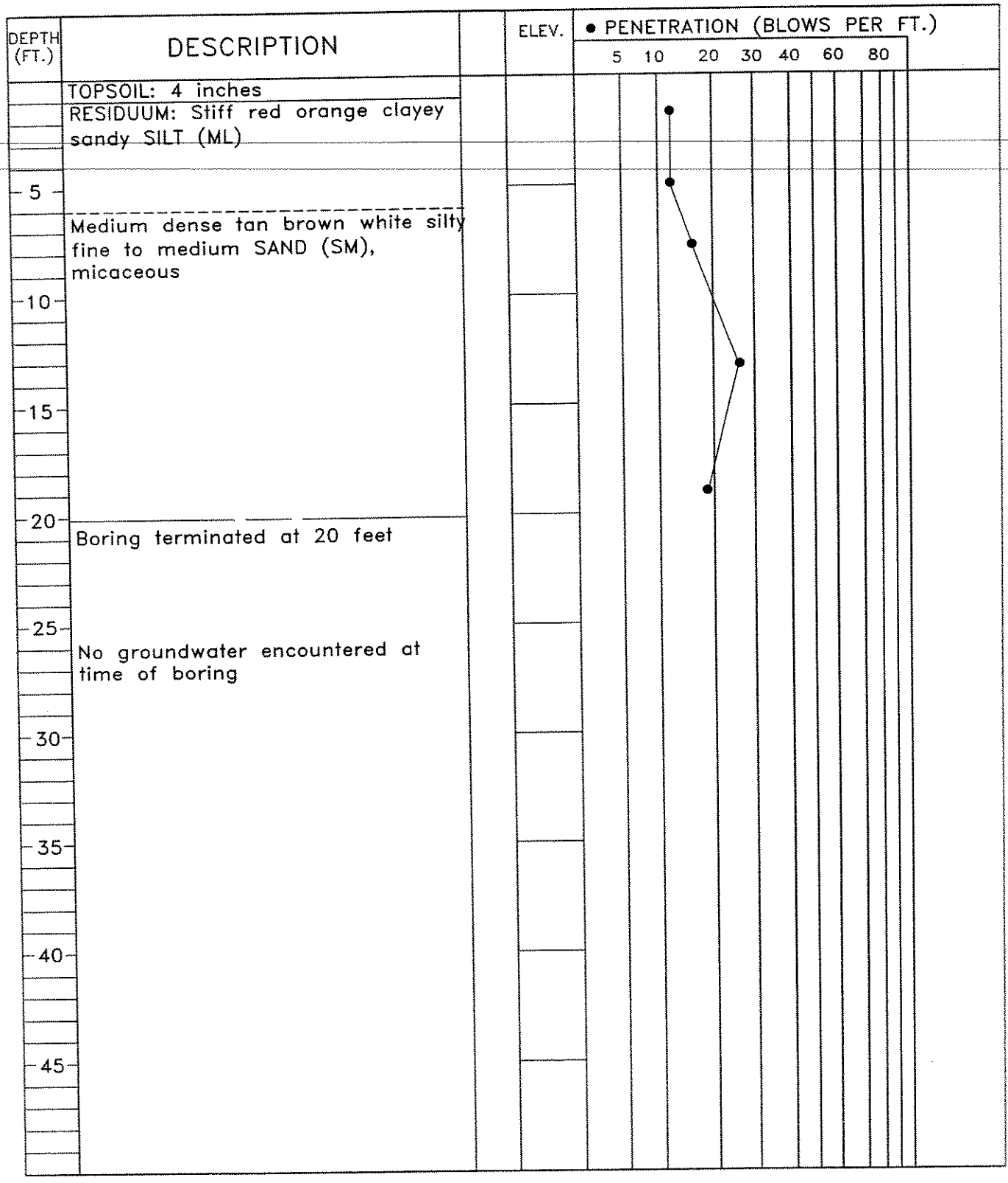
C CAVED DEPTH - 24 HRS. ▽ GROUNDWATER LEVEL - 24 HRS.

UNDISTURBED SAMPLE ▽ GROUNDWATER LEVEL AT TIME OF BORING

(XX) - DENOTES UNIFIED SOIL CLASSIFICATION SYSTEM

BORING NO. B-9
DATE DRILLED 2/18/03
JOB NO. 203037
PAGE 1 OF 1

PIEDMONT GEOTECHNICAL CONSULTANTS, INC.



SOIL BORING RECORD

BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113
PENETRATION IS THE NUMBER OF BLOWS OF 140 LBS.HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

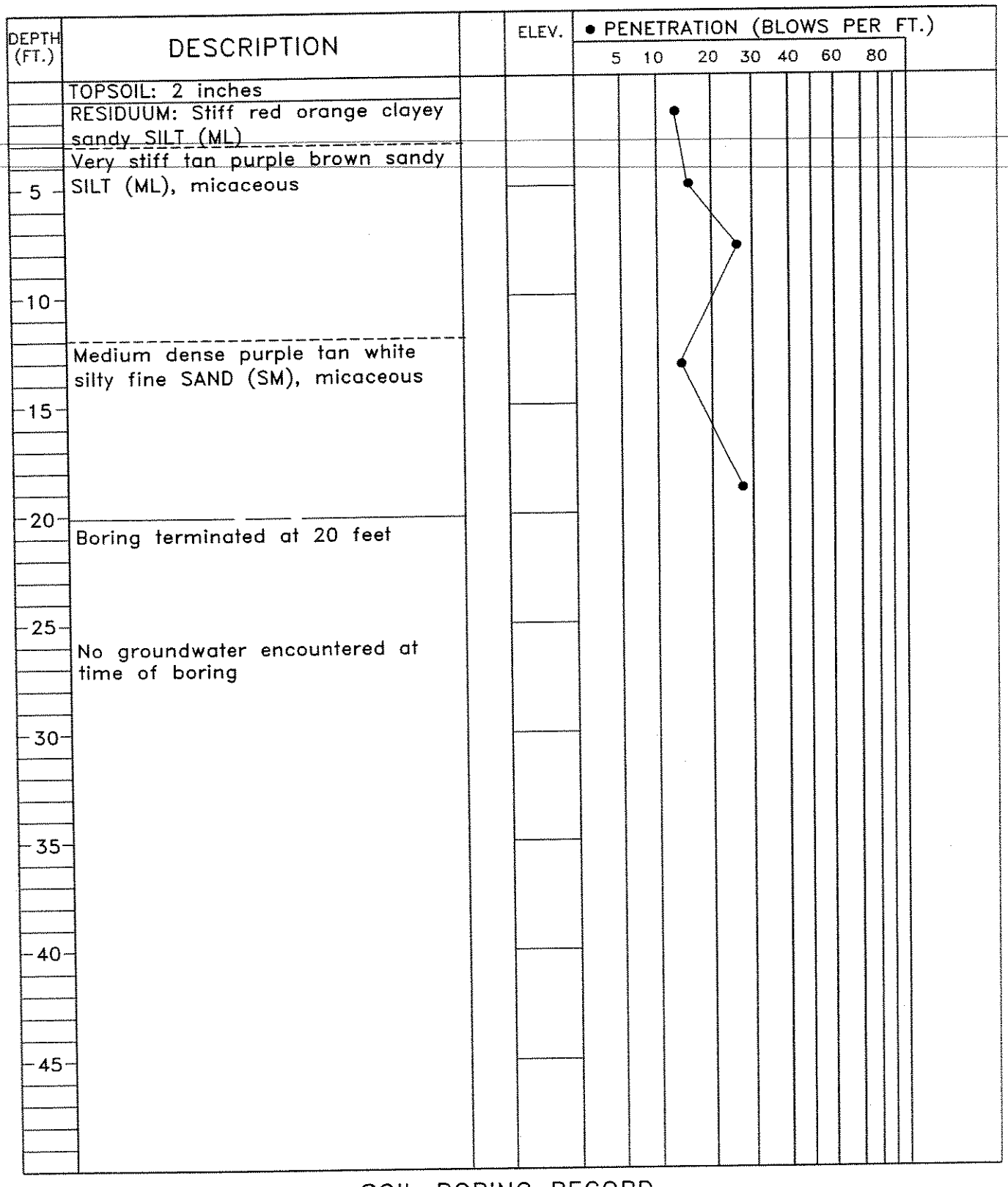
C CAVED DEPTH - 24 HRS. ▽ GROUNDWATER LEVEL - 24 HRS.

▮ UNDISTURBED SAMPLE ▽ GROUNDWATER LEVEL AT TIME OF BORING

(XX) - DENOTES UNIFIED SOIL CLASSIFICATION SYSTEM

BORING NO. B-10
DATE DRILLED 2/18/03
JOB NO. 203037
PAGE 1 OF 1

PIEDMONT GEOTECHNICAL CONSULTANTS, INC.



SOIL BORING RECORD

BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113
PENETRATION IS THE NUMBER OF BLOWS OF 140 LBS.HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

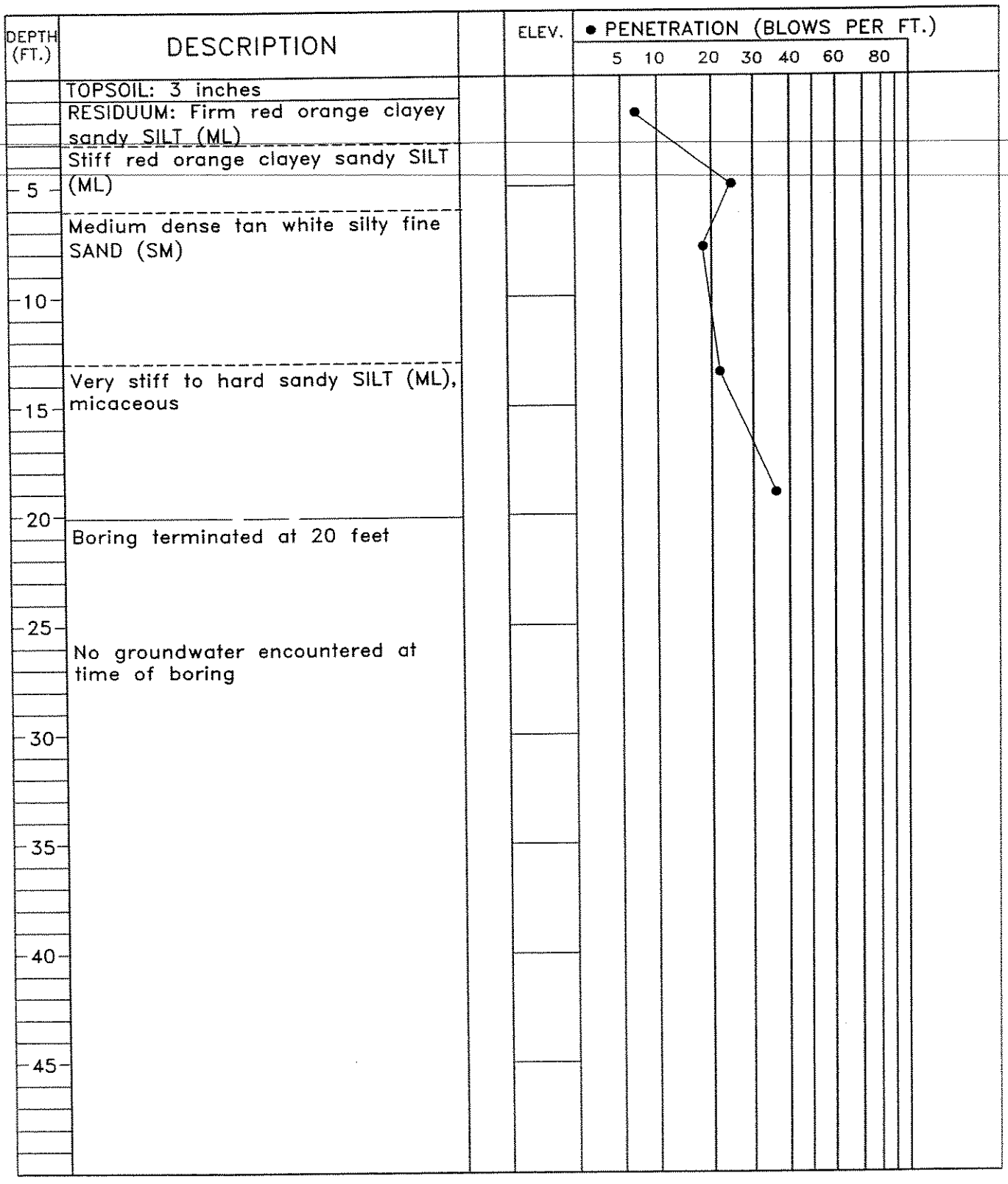
C CAVED DEPTH - 24 HRS. ▽ GROUNDWATER LEVEL - 24 HRS.

UNDISTURBED SAMPLE ▽ GROUNDWATER LEVEL AT TIME OF BORING

(XX) - DENOTES UNIFIED SOIL CLASSIFICATION SYSTEM

BORING NO. B-11
DATE DRILLED 2/18/03
JOB NO. 203037
PAGE 1 OF 1

PIEDMONT GEOTECHNICAL CONSULTANTS, INC.



SOIL BORING RECORD

BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113
PENETRATION IS THE NUMBER OF BLOWS OF 140 LBS.HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

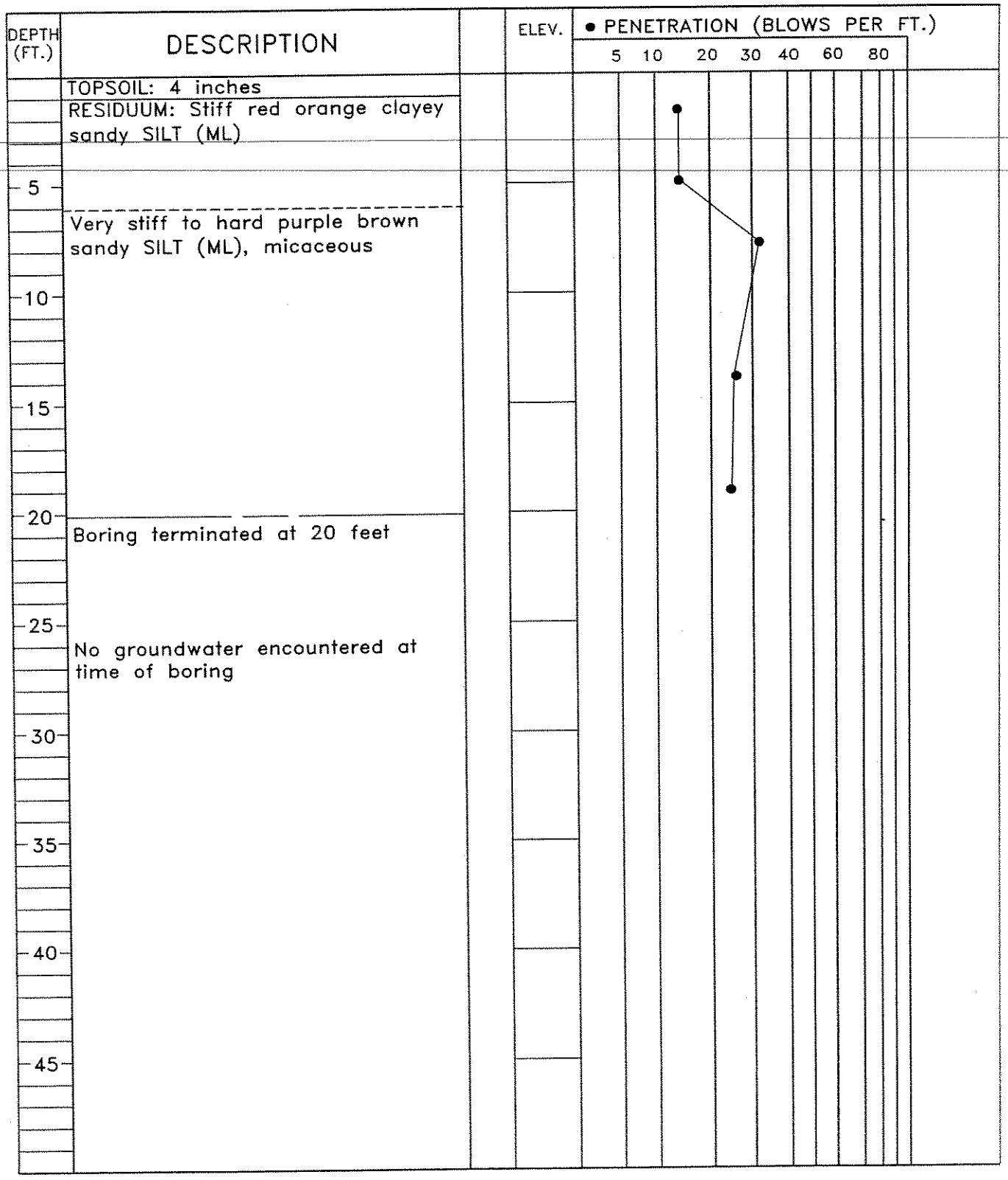
C CAVED DEPTH - 24 HRS. ▽ GROUNDWATER LEVEL - 24 HRS.

▮ UNDISTURBED SAMPLE ▽ GROUNDWATER LEVEL AT TIME OF BORING

(XX) - DENOTES UNIFIED SOIL CLASSIFICATION SYSTEM

BORING NO. B-12
DATE DRILLED 2/18/03
JOB NO. 203037
PAGE 1 OF 1

PIEDMONT GEOTECHNICAL CONSULTANTS, INC.



SOIL BORING RECORD

BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113
PENETRATION IS THE NUMBER OF BLOWS OF 140 LBS.HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

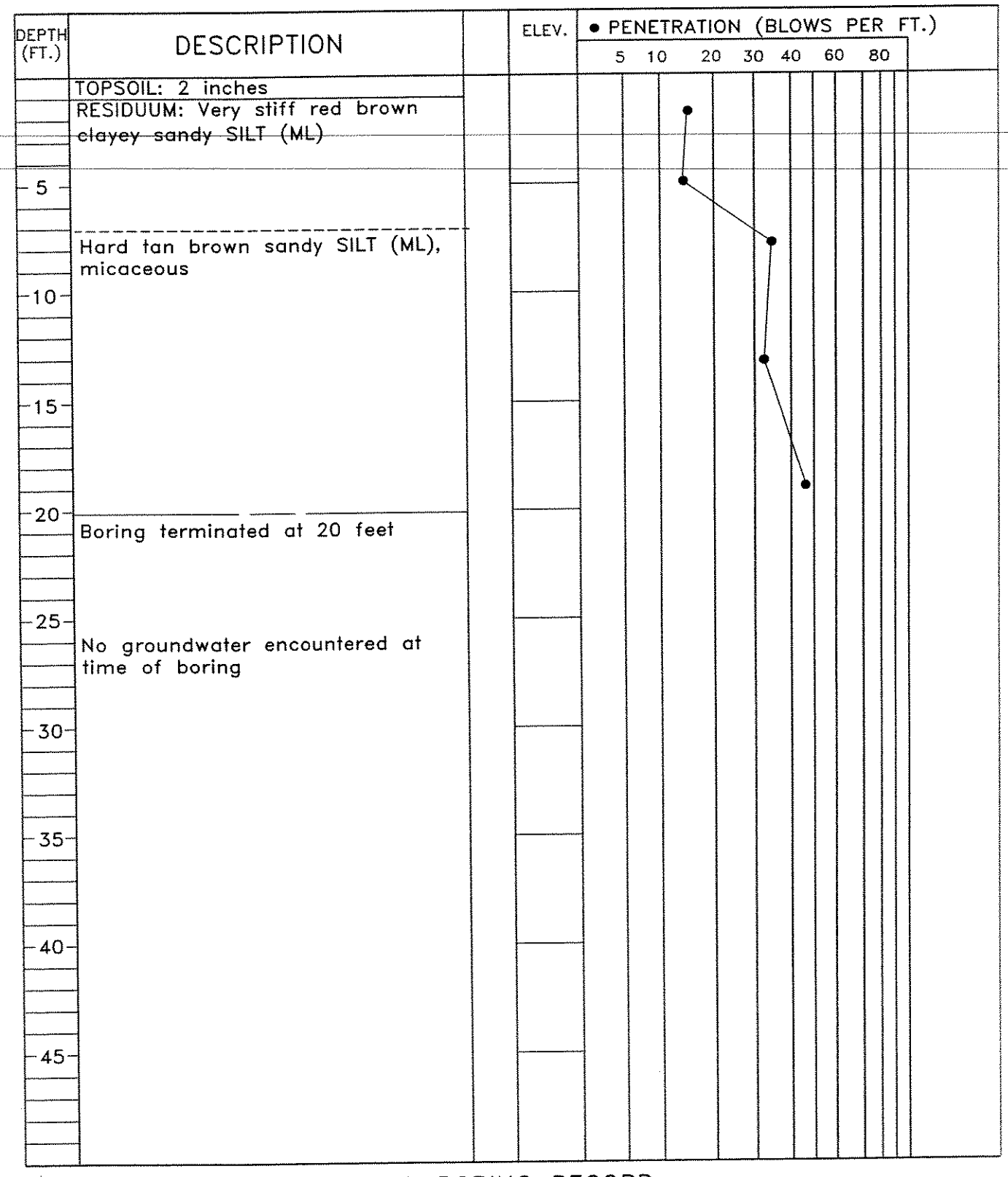
C CAVED DEPTH - 24 HRS. ▽ GROUNDWATER LEVEL - 24 HRS.

▮ UNDISTURBED SAMPLE ▽ GROUNDWATER LEVEL AT TIME OF BORING

(XX) - DENOTES UNIFIED SOIL CLASSIFICATION SYSTEM

BORING NO. B-13
DATE DRILLED 2/18/03
JOB NO. 203037
PAGE 1 OF 1

PIEDMONT GEOTECHNICAL CONSULTANTS, INC.



SOIL BORING RECORD

BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113
PENETRATION IS THE NUMBER OF BLOWS OF 140 LBS.HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

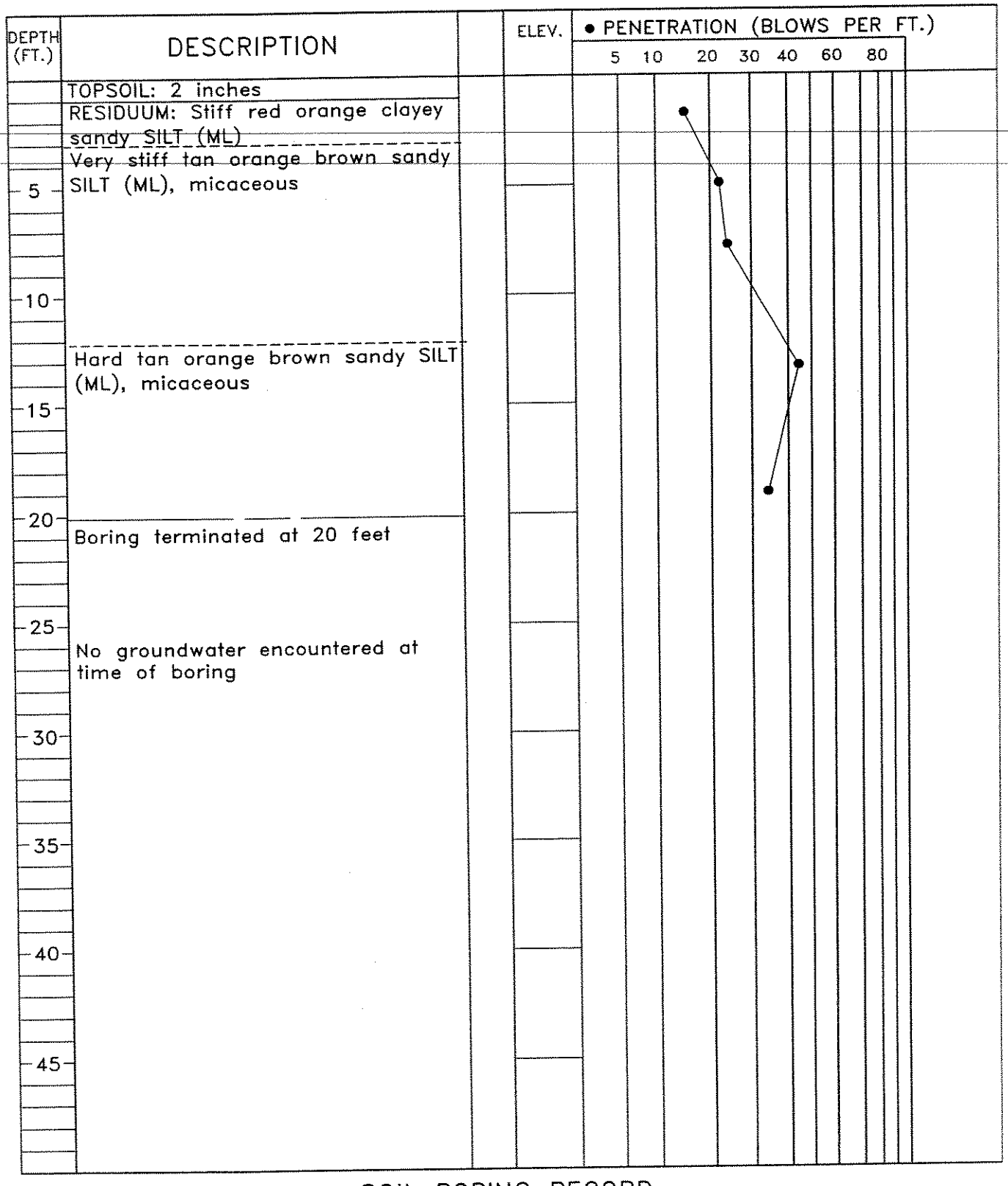
C CAVED DEPTH - 24 HRS. ▽ GROUNDWATER LEVEL - 24 HRS.

▮ UNDISTURBED SAMPLE ▽ GROUNDWATER LEVEL AT TIME OF BORING

(XX) - DENOTES UNIFIED SOIL CLASSIFICATION SYSTEM

BORING NO. B-14
DATE DRILLED 2/19/03
JOB NO. 203037
PAGE 1 OF 1

PIEDMONT GEOTECHNICAL CONSULTANTS, INC.



SOIL BORING RECORD

BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113
PENETRATION IS THE NUMBER OF BLOWS OF 140 LBS.HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

C CAVED DEPTH - 24 HRS. ▽ GROUNDWATER LEVEL - 24 HRS.

▮ UNDISTURBED SAMPLE ▽ GROUNDWATER LEVEL AT TIME OF BORING

(XX) - DENOTES UNIFIED SOIL CLASSIFICATION SYSTEM

BORING NO. B-15
DATE DRILLED 2/19/03
JOB NO. 203037
PAGE 1 OF 1

SECTION 02 110 - SITE CLEARING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section covers general site clearing including:
1. Removal of trees and other vegetation.
2. Topsoil stripping.
3. Clearing and grubbing.
4. Removal of site improvements

1.02 JOB CONDITIONS:

A. Protect improvements on adjoining properties and on Owner's property as indicated to remain in place.

B. Restore damaged improvements to their original condition, as acceptable to parties having jurisdiction.

PART 2 - PRODUCTS (Not applicable)

PART 3 - 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 as specifically indicated. Removal includes digging out stumps and roots.

B. Clearing and Grubbing: Clear site of trees, shrubs and other vegetation as indicated on the drawing and as necessary. Keep those indicated to be left standing.

1. Completely remove stumps, roots, and other debris protruding through ground surface.

2. Fill depressions caused by clearing & grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

3. Place fill material in horizontal layers not exceeding 6" loose depth, and thoroughly compact to a density equal to adjacent original ground.

C. Topsoil: Topsoil is defined as friable clay loam surface soil found in a depth indicated in the soils report. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2" in diameter, and without weeds, roots, and other objectionable material.
1. Strip Topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.

2. Remove heavy growths of grass from areas before stripping.

3. Where trees are indicated to be left standing, stop topsoil stripping a sufficient distance to

prevent damage to main root system.

4. Stockpile topsoil in storage piles in areas where directed.

D. Remove site improvements necessary to permit construction.

3.02 DISPOSAL OF WASTE MATERIALS:

A. Burning on Owner's Property: Burning will be permitted only at designated areas and times directed by Owner and as permitted by local authorities. Attend burning materials until fires have burned out or have been extinguished.

B. Remove non-combustible debris and remains of burned debris from Owner's property and dispose of off-site in legal manner.

C. Dispose off waste excess fill material, per local and state regulations.

END OF SECTION 02 100

SECTION 02 122 - TREE PROTECTION AND TRIMMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the protection and trimming of trees that are to remain but interfere with, or are affected by, execution of the Work, whether temporary or new construction.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

C. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Certification by a qualified arborist that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

E. Maintenance recommendations for care and protection of trees affected by construction after completing the Work.

1.4 QUALITY ASSURANCE

A. Tree Service Qualifications: Engage an experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this Project.

B. Tree Pruning Standards: Comply with the National Arborist Association's "Pruning Standards for Shade Trees" except where more stringent requirements are indicated.

C. Preinstallation Conference: Conduct conference at the Project site to comply with requirements of Division 1 Section "Project Meetings."

1. Before commencing tree protection and trimming, meet with representatives of authorities having jurisdiction, Owner, Architect, consultants, and other concerned entities. Review tree protection and trimming procedures and responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Drainage Fill: Selected crushed stone, or crushed or uncrushed gravel, washed, ASTM D 448, size 24, with 90 to 100 percent passing a 2-1/2-inch (63-mm) sieve and not more than 10 percent passing a 3/4-inch (19-mm) sieve.

B. Topsoil: Fertile, friable, surface soil, containing natural loam and complying with ASTM D 5268. Provide topsoil that is free of stones larger than 1 inch (25 mm) in any dimension and free of other extraneous or toxic matter harmful to plant growth. Obtain topsoil only from well-drained sites where soil occurs in depth of 4 inches (100 mm) or more; do not obtain from bogs or marshes.

C. Filter Fabric: Manufacturer's standard, nonwoven, pervious, geotextile fabric of polypropylene, nylon, or polyester fibers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Temporary Protection: Provide temporary fencing, barricades, or other suitable guards located outside the drip line (outer perimeter of branches) to protect remaining trees and other plants from damage.

B. Protect tree root systems from damage due to noxious materials caused by run-off or spillage while mixing, placing, or storing construction materials. Protect root systems from flooding, eroding, or excessive wetting caused by dewatering operations.

C. Do not store construction materials, debris, or excavated material within the drip line of remaining trees. Do not permit vehicles or foot traffic within the drip line, and prevent soil compaction over root systems.

D. Do not allow fires under or adjacent to remaining trees or other plants.

3.2 EXCAVATION

A. Install shoring or other protective support systems to minimize sloping or benching of excavations.

B. Do not excavate within tree drip line, unless otherwise indicated.

C. Where excavation for new construction is required within tree drip lines, hand excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.

1. Relocate roots in backfill areas wherever possible. If encountering large, main lateral roots, expose beyond excavation limits as required to bend and relocate without breaking. If encountered immediately adjacent to location of new construction and relocation is not practical, cut roots approximately 3 inches (75 mm) back from new construction.

2. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition and temporarily support and protect roots from damage until they are permanently relocated and covered with earth.

D. Where utilities trenches are required within tree drip lines, tunnel under or around the roots by drilling, auger boring, pipe jacking, or digging by hand.

1. Root Pruning: Do not cut main lateral roots or tap roots; cut only smaller roots that interfere with installation of new work. Cut roots with sharp pruning instruments; do not break or chop.

3.3 REGRADING

A. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist.

1. Root Pruning: Prune tree roots exposed during grade lowering. Do not cut main lateral roots or tap roots; cut only smaller roots. Cut roots with sharp pruning instruments; do not break or chop.

B. Minor Fill: Where existing grade is 6 inches (150 mm) or less below elevation of finish grade shown, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

C. Moderate Fill: Where existing grade is more than 6 inches (150 mm) but less than 12 inches (300 mm) below finish grade elevation, place a layer of drainage fill, filter fabric, and a final layer of topsoil on existing grade.

1. Carefully place drainage fill against tree trunk approximately 2 inches (50 mm) above finish grade elevation and extend not less than 18 inches (450 mm) from tree trunk on all sides. For balance of area within drip-line perimeter, place drainage fill to an elevation 6 inches (150 mm) below grade.
2. Place filter fabric with overlapping edges of 6 inches (150 mm) minimum.
3. Place fill layer of topsoil to finish grade. Do not compact drainage fill or topsoil. Hand grade to required finish elevations.

3.4 TREE PRUNING

A. Prune remaining trees affected by temporary and new construction.

B. Prune remaining trees to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during the Contract period as recommended by arborist.

C. Pruning Standards: Prune trees according to the National Arborist Association's "Pruning Standards for Shade Trees."

1. Class II: Standard pruning.

D. Cut branches with sharp pruning instruments; do not break or chop.

E. Chip branches removed from trees. Spread material where indicated or as directed by Architect.

3.5 TREE REPAIR AND REPLACEMENT

A. Promptly repair trees damaged by construction operations to prevent progressive deterioration.

B. Remove and replace dead and damaged trees that the arborist determines to be incapable of restoring to a normal growth pattern.

1. Provide new trees of 6-inch- (150-mm-) caliper size and of a species selected by Landscape Architect when trees over 6 inches (150 mm) in caliper, measured 12 inches (300 mm) above grade, are required to be replaced.

3.6 DISPOSAL OF WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, and excess chips from Owner's property.

END OF SECTION 02122

SECTION 02 200 – EARTHWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Backfill of site clearing excavations.
2. Preparation of subgrade for building slab.
3. Trench excavation and backfilling.

B. Related Section: Section 02 270, erosion control.

1.02 SUBMITTALS

A. Test Reports: Geotechnical inspection and test reports.

1.03 QUALITY ASSURANCE

A. Geotechnical Testing: Owner will select and provide testing service under separate contract to provide field quality control during earthwork execution.

B. Existing Utilities: Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

C. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, during occupied hours, except when permitted in writing by Architect/Engineer and then only after acceptable temporary utility services have been provided. Provide minimum of 48-hour notice to Architect/Engineer, and receive written notice to proceed before interrupting any utility. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

D. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning signs.

E. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

PART 2 – PRODUCTS

2.01 SOIL MATERIALS

A. Definitions:
1. Satisfactory soil material: Clean subsoil, free of debris, organic matter, topsoil, frozen matter and rock larger than 1/2 cubic foot.
2. Unsatisfactory soil material: Soil materials not capable of compaction to required density,

rock larger than 1/2 cubic foot, debris and organic matter.

3. Backfill and Fill Materials: Satisfactory soil materials free of waste, frozen materials, vegetable and other deleterious matter.

PART 3 - EXECUTION

3.01 EXCAVATION:

A. Excavation consists of removal and disposal of material encountered when establishing required finish grade elevations.

1. Excavate to lines and levels indicated. Provide space for foundation work and inspection. Cut excavations clean with level bottoms. Where changes in levels occur, provide vertical steps in horizontal runs. If soil conditions permit, cut footing trenches to exact size of concrete and omit forms. Notify Architect if earth of doubtful bearing is encountered. Carry excavations to required depth. If adequate bearing is not encountered within 8" of depth shown, excavations shall be carried deeper upon authorization and paid for as extra work.

2. Excavation Classification: The following classification of excavation will be made when unanticipated rock excavation is encountered in the work:

a. Do not perform such work until material to be excavated has been cross-sectioned and classified by Architect. Such excavation will be paid on basis of contract conditions relative to changes in work.

b. Earth excavation includes removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, material of any classification indicated in data on subsurface conditions, and other materials encountered that are not classified as rock excavation or unauthorized excavation.

c. Rock Excavation:

1. General Excavation - Any material which cannot be excavated with single-tooth ripper drawn by a crawler tractor having a minimum draw bar pull rated at not less than 53,000 pounds (D 8 or equivalent).
2. Trench Excavation: Any material which cannot be excavated with a backhoe having a bucket curling force rated at not less than 18,000 pounds (Caterpillar 215 series backhoe or equivalent), and occupying an original volume of at least one (1) cubic yard or more.
3. Intermittent drilling performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.
4. Rock payment lines are limited to the following:
   a. Two feet outside of concrete work which forms are required, except footings.
   b. One foot outside the perimeter and bottom of footings.
   c. In pipe trenches, 6" below invert elevation of pipe and 2’ wider than the inside diameter of pipe, but not less than 3’ minimum trench width.
   d. Neat outside dimensions of concrete work where no forms are required.
   e. Under slabs on grade, 6" below the bottom of concrete slabs.

B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Architect/Engineer. Unauthorized excavation, as well as remedial work directed by Architect, shall be at Contractor's expense.

1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Architect/Engineer.

2. Elsewhere, backfill & compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Architect/Engineer.

C. Additional Excavation: When excavation has reached required subgrade elevations, notify Architect/Engineer who will make an inspection of conditions.
1. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by Architect/Engineer.
2. Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.

D. Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

E. Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

F. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade and shape stockpiles for proper drainage.
1. Locate & retain soil away from the edge of excavations.
2. Dispose of excess soil material and waste materials as specified herein.

G. Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

H. Excavation for Walks: Cut surface under walks to comply with cross-sections, elevations and grades as shown.

I. Excavation for Trenches: Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room. Provide 6" to 9" clearance on both sides of pipe or conduit.
1. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations. Beyond building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freeze-ups.
2. Where rock is encountered, carry excavation 6" below require elevation and backfill with a 6" layer of crushed stone or gravel prior to installation of pipe.
3. For pipes or conduit 5" or less in nominal size and for flat-bottomed multiple conduit units, do not excavate beyond indicated depths. Hand excavate bottom cut to accurate elevation. Support pipe on undisturbed soil.

4. For pipes 6" diameter or larger, tanks and other mechanical / electrical work indicated to receive subbase, excavate to subbase depth indicated, or, if not otherwise indicated, to 6 below bottom of work to be supported.
5. Except as otherwise indicated, excavate for exterior water-bearing piping (water, steam, condensate, drainage) so top of piping is not less than 3'-6" below finished grade.
6. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire of pipe.
7. Backfill trenches with concrete where the trench excavations pass within 18" of column or wall footings and which are carried below bottom of such footings, or which pass under wall footings. Place concrete to level of bottom of adjacent footing.
8. Do not backfill trenches until tests and inspections have been made and backfilling authorized by Architect/Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.
9. For pipe or conduit less than 30" below surface of roadways, provide 4" thick concrete base slab support. After installation and testing of pipe, provide minimum 4" thick encasement (sides and top) of concrete prior to backfilling or placement of roadway subbase.

J. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 deg F.

3.02 COMPACTION:

A. General: Control soil compaction during construction providing minimum percentage of density specified for each area classification as indicated below.

B. Percentage of Maximum Density Requirements: Compact subgrade and structural fill material to the following percentages of maximum density in accordance with Standard Proctor, ASTM D698:

1. Building Slabs and Pavement: Scarify and recompact top 8 inches of subgrade and compact each layer of backfill or fill material at 98 percent.
2. Lawn Areas: Scarify and recompact top 8” of subgrade. Compact each layer of backfill or fill material at 90%.

C. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operation.

1. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
2. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry.
3. Assist drying by dicing, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

3.03 BACKFILL AND FILL:

A. General: Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.
1. In excavations, use satisfactory excavated or borrow material.
2. Under grassed areas, use satisfactory excavated or borrow material.
3. Under walks use satisfactory excavated or borrow material.
4. Under piping and conduit, use satisfactory excavation or borrow material.

B. Backfill excavations as promptly as work permits, but not until completion of the following:
1. Acceptance of construction below finish grade.
2. Inspection, testing, approval, and recording locations of underground utilities.
3. Removal of concrete formwork.
4. Removal of shoring and bracing, and backfillinq of voids with satisfactory materials.
5. Removal of trash and debris.
6. Permanent or temp. horizontal bracing is in place on horizontally supported walls.

C. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills.

D. Placement and Compaction: Place backfill and fill materials in layers not more than 8" in loose depth for material compacted by heavy compaction equipment, and not more than 4" in loose depth for material compacted by hand-operated tampers.
1. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place any kind of fill material on surfaces that are muddy, or contain frost or ice.
2. Place backfill and fill materials evenly adjacent to structures, piping or conduit to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping or conduit to approximately same elevation in each lift.

3.04 GRADING:

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes.

C. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.05 FIELD QUALITY CONTROL

A. Geotechnical Testing: Allow testing service to inspect and approve subgrades and fill layers before covering.

B. Subgrade Inspection: Proofroll to locate any unsatisfactory soil material.

C. Field Density Test: Preform in place for each 2 feet of structural layer.
   1. Large Areas (> 10 acres): 1 test per 2500 square feet.
   2. Small Areas (< 10 acres): 3 tests per 2500 square feet.

D. Foundation Inspection: Verify design bearing pressure of exposed soil material.

E. Provide additional material, corrective work and testing, at no additional cost to owner, if in architects opinion based on geotechnical reports, subgrade or structural fill is placed below specified density.

3.06 DISPOSAL OF EXCESS AND WASTE MATERIALS:

A. Waste excess or unacceptable excavated material shall be hauled away from the site and disposed off in accordance with local and state guidelines. No extra amount will be paid for this work.

END OF SECTION 02 200

SECTION 02 210 - SITE GRADING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This Section covers excavation, fill, disposal of surplus earth and debris and finished grading. Also included are wrecking, demolition and removal of on-grade or below-grade obstructions.

1.02 QUALITY ASSURANCE

A. Workmanship.
1. Perform all Work in accordance with requirements of the Drawings and Specifications and in a manner which will ensure reasonable accuracy in preserving lines and levels shown.

1.03 SUBMITTALS

A. Test Reports:
1. All field test results ,if any, shall be submitted to Designer-Owner for review.

1.04 JOB CONDITIONS

A. Subsurface Information.

1. Soil borings for design purposes have been made at the Site. The depth of the water table at the time the borings were made is shown on the log. The Contractor is expected to have examined the Site and the record of the soils investigation and to have decided for himself the character of the materials to be encountered.

B. Environmental Requirements:

1. Newly Graded Areas. Take every precaution and temporary measure necessary, such as temporary seeding, to prevent damage from erosion of freshly graded areas. Repair any settlement or washing that may occur prior to acceptance of the Work and re-establish the grades to the required elevations and slopes at no additional cost to the Design-Owner. This shall apply to damage to the newly graded areas within the construction limits and damage to adjacent properties by eroded materials.

C. Protection:

1. Trees.
a. General Protection. The Contractor shall be responsible for the protection of tops, trunks and roots of existing trees on project site that are to remain. Box, fence or protect existing trees subject to construction damage before any work is started. Remove boxing when directed. Do not permit heavy equipment or stockpiles within branch spread. Remove interfering branches without injury to trunks and cover scars with tree paint.
b. Grading Around Trees. Where excavating, fill or grading is required within the branch spread of trees that are to remain, the Work shall be performed as follows:
1) Trenching. When trenching occurs around trees to remain, do not cut the tree roots but tunnel the trench under or around the roots by carefully hand digging and without injury to the roots.

2) Raising Grades. When the existing grade at tree is below the new finished grade, and fill not exceeding 16 inches (400 mm) is required, place clean washed gravel graded from 1 to 2 inch (25 to 50 mm) size directly around the tree trunk. The gravel shall extend out from trunk on all sides a minimum of 18 inches (450 mm) and finish approximately 2 inches (52 mm) above the finished grade at tree. Install gravel before any earth fill is placed. New earth fill shall not be left in contact with the trunks of any trees requiring fill.

3) Trees marked for preservation that are buried in fills over 16 inches (400 mm) deep shall have an open dry well of durable masonry (without mortar) situated at least 12 inches (300 mm) from the tree trunk. Drain all wells properly. Before fills of over 16 inches (400 mm) are made upon the tree root areas, spread at least a 6 inch (150 mm) layer of broken stone or coarse gravel covered by inverted sods to facilitate proper drainage and aeration.

4) Lowering Grades. Under the drip-line of existing trees in areas where the new finished grade is to be lowered, regraded Work shall be done by hand to elevation as indicated. Cut roots as required cleanly 3 inches (75 mm) below finished grade and cover scars with tree paint.

5) Trees marked for preservation that are located more than 6 inches (150 mm) above proposed grades shall stand on broad rounded mounds and be graded smoothly into the lower level. Cut exposed or broken roots clean and cover with topsoil.

c. Tree Surgery. Before the buildings are occupied, trim of all dead and diseased limbs of existing trees. All cuts shall be made close to the trunk and shall be covered with an acceptable tree paint manufactured for this specific purpose. The services of a qualified tree surgeon are required.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil.

1. Topsoil shall be natural, fertile, agricultural soil, capable of sustaining vigorous plant growth. It shall be of uniform composition throughout, without admixture of subsoil. It shall be free of stones, lumps, live plants and their roots, sticks, and other extraneous matter.
2. Topsoil shall have acidity range of ph 5.0 to ph 7.0 and shall contain not less than 3 percent organic matter.
   a. When the ph value of the topsoil is less than 5, it shall be increased by applying ground limestone at a rate necessary to attain a ph value of 6.
3. The gradation of the topsoil furnished shall be determined by a laboratory using the bouyoucos hydrometer analysis conforming to the requirements of current AASHTO designation T-88. The gradation of the topsoil shall be within the following ranges:

   Sand (2 millimetres to 50 micrometres) 40 to 80 percent
   Silt (50 micrometres to 5 micrometres) 10 to 30 percent
   Clay (5 micrometres and smaller) 10 to 30 percent

4. In all planting beds the topsoil shall be to a minimum depth of 12 inches (300 mm) and shall be worked up into planting condition. Eliminate all foreign material prior to any planting.

PART 3 EXECUTION

3.01 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

A. Grading.

1. Stripping. When fills are to be constructed over cultivated or fallowed land, the entire area upon which the fill is to be constructed shall first be cleared of vegetation and then smoothed with a blade grader. When fills are to be constructed over sodded surfaces, strip the sod to a depth of 2 inches (50 mm). Then roll these smoothed or stripped surfaces to the specified density required for fill prior to the fill material placement. Dispose of stripped material as waste and completely remove from the site.
2. Conservation of Topsoil. Excavate the topsoil to a depth of 6 inches (150 mm) and carefully remove and spread on areas already graded and prepared for topsoil or deposit in storage piles convenient to the areas, which are subsequently to receive application of topsoil. Stockpile topsoil free of roots, stones and other undesirable material. Keep topsoil, when stored, separate from other excavated materials. Cover storage piles as required preventing wind blown dust.
3. Excavation. Perform excavation of every description and of whatever substances encountered within the grading limits of the project to the lines and grades indicated on the Drawings. If rock is encountered during excavation, excavate rock to a depth at 6 inches (150 mm) below elevation for the finished sub grade. Transport to and place all suitable excavated material in the fill areas within the limits of the work as specified and as shown on the drawings. All excavated materials, such as weeds, sod and trash, or perishable materials, logs, stumps, and any surplus of excavated material which is not required for fill shall be removed from project site and disposed of by the Contractor. Perform excavation and filling in a manner and sequence that will provide drainage at all times.
4. Borrow Material. Material required for fills in excess of that produced by normal grading operations shall be excavated from borrow areas on the site if specifically so stated on the Drawings or from borrow areas completely arranged for by the Contractor and at the Contractor's expense. All borrow material is subject to review by the Geotechnical Engineer and the material shall be selected to meet the requirements and conditions of the particular fill for which it is to be used.
5. Preparation of Ground Surface for Fill. Sloped ground surfaces steeper than 5 to 1 upon which fill is to be placed shall be plowed, stepped or broken up in such a manner that fill material will bond with the existing surfaces. Wet and compact prepared surfaces as specified.
6. Fills. Construct fills at the locations and to the lines and grades indicated on the Drawings. Make sure that the completed fill corresponds to the shape of the typical sections shown on the drawings or meets the requirements of the particular case. Use all suitable material removed from the excavation in forming the necessary fill. All fill material shall be reasonably free from logs, stumps, sod, weeds, or other perishable material, trash, frozen material and from all stones having a maximum dimension greater than 6 inches (150 mm). No stones shall be permitted in the top 12 inches (300 mm) of fills. Place the material in successive horizontal layers not exceeding 8 inches (200 mm) in loose depth. Keep fill material spread uniformly. Remove any soft sections, and fill holes or depressions to required grades with approved material and shape the entire area to line, grade, and cross section and thoroughly compact as specified. The Contractor is responsible for adjustment of

the moisture content of the fill material if necessary so that the specified compaction can be obtained. The rough grade for the entire site or portion thereof shall be approved by the Architect before placement of any topsoil.

a. Subgrade Preparation. Shape, dress, moisten and compact as specified subgrades for all drives, parking areas, sidewalks and other structures. Test the subgrade for crown, elevation and density in advance of placing pavement.

b. Spreading of Topsoil. Upon completion of rough grading, spread the stockpiled topsoil for a uniform depth of 6 inches (150 mm), after settlement, over all areas graded under this Contract not receiving other surfacing, just prior to the sodding or landscaping operation. Before spreading the topsoil, scarify the graded areas for a depth of 3 inches (75 mm) and repair all settlements and washes.

7. Finished Grading. Accomplish uniformly smooth grading of all areas covered by the Project, including excavated and filled sections and adjacent transition areas so that the finished surface is reasonably smooth, compacted and free from irregular surfaces changes. The degree of finish shall be that ordinarily obtainable from blade-grader operations except as otherwise specified. The finished surface shall be not more than 2 inches (50 mm) above or below the established grade or approved cross section. Finish all swales so as to drain readily.

8. Backfill material shall be the same as specified for fill and shall be placed and compacted as specified for fill unless otherwise noted.

9. Granular Fill.

a. Construct granular fill material when called for on the Drawings on the previously prepared subgrade to the lines and grades and thicknesses and dimensions shown on the Drawings.

b. Place and spread materials on previously prepared subgrade that has been moistened sufficiently to prevent moisture loss in foundation materials but not enough to cause soft spots. Place sufficient material so that when spread, struck off by an approved template and compacted as required herein, the resulting granular fill shall be of the required thickness and shape.

c. After compaction, check the surface with template and straightedge and correct and recompact all high or low spots.

3.02 FIELD QUALITY CONTROL

A. Compaction.

1. Compact each layer of fill by rolling with approved rollers to at least the following percentages of maximum density at a moisture content no less than 3 percent above to 3 percent below optimum moisture as determined by ASTM D 698.

MATERIAL	PERCENT OF MAXIMUM DENSITY
Fill	90
Subgrade (top 12 inches (300 mm) beneath pavements)	95
Subgrade (top 6 inches 150 mm) beneath walks)	95

2. In cut sections, compact top 12 inches (300 mm) of subgrade under pavements and top 6 inches (150 mm) of subgrade under sidewalks to the same density as required for fill hereinbefore.
3. Compact granular fill to 70 percent of the relative density as determined by ASTM D 4254.

B. Testing. An independent testing laboratory shall make the following tests on embankments. All costs for tests shall be as covered in GENERAL CONDITIONS.
1. Maximum Density Determination. Tests shall be made on two separate samples to determine maximum density at optimum moisture. Samples shall be taken where directed by the Geotechnical Engineer.
2. Compaction Tests. Compaction or in-place density tests shall be taken at locations requested by the Geotechnical Engineer. Fill not meeting the required compaction shall be removed, replaced, recompacted and retested at the expense of the Contractor. Give proper notice to the Geotechnical Engineer when rework is to be accomplished.

END OF SECTION 02 210

SECTION 02 270 - EROSION CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION:

This section covers temporary erosion control required to prevent soil erosion and contain sediment on site, during construction period. Contractors are advised to follow 'Manual for Erosion and Sediment Control in Georgia' – 1996 edition.

NOTE: Grass is covered in Section 02930.

PART 2 - PRODUCTS

2.01 SEDIMENT BARRIERS:

A. Silt Fence: Filter fabric and posts meeting Georgia D.O.T. Specification Section 171 - Temporary Silt Fence (1983 Edition) - Type B.

2.01 EROSION CONTROL BLANKET

A. Manufacturer:

1. Specified product is manufactured by American Excelsior Company.

2. Similar products of other manufacturers are acceptable without prior approval.

B. Product:

1. Erosion Control Blanket: Popular wood excelsior, double standard, blanket encased in between photodegradable plastic netting. Weight shall be minimum 1.0 pound per square yard and the roll size be 4' by 180'.

2. Sod Staples: 6 inch long, steel.

PART 3 - EXECUTION:

3.01 GENERAL:

A. Temporary erosion control is considered incidental to all land disturbing operations. The drawings show the limits of permanent grassing required under this contract. The Contractor is responsible for erosion control over the entire site.

B. Design temporary erosion control measures to control soil erosion at its potential source with downstream sediment barriers used as a backup.

C. Install erosion control blanket on any disturbed slope 2:1 or greater.

3.02 TEMPORARY EROSION CONTROL

A. Install sediment barriers prior to site clearing work, at bottom of slopes, around drainage

structure inlets and along any adjacent paved areas.

B. Install new storm sewer system as soon as possible and divert surface water into system.

C. Install ground cover consisting of mulch, polyethylene sheets or grass over exposed soil within 2 weeks after site clearing begins.

D. Maintain erosion control measures until permanent site construction work is complete and permanent grass is established over disturbed areas. Clean up washouts and repair sediment barriers promptly. Remove accumulated sediment when it reaches mid-height of barrier.

E. Maintain construction access to roadways by preventing mud from washing or being tracked onto existing paving.

3.03 EROSION CONTROL BLANKET

A. Prepare, fertilize and seed area to be covered in compliance with Section 02930.

B. Apply blanket to slope vertically. Upper end shall be buried a minimum of 6 inches below grade.

C. Anchor blanket with sod staples in compliance with manufacturers suggested pattern and spacing.

3.04 CLEAN-UP AND REMOVAL

Remove temporary erosion control measures, including accumulated sediment and restore effected areas, after approval by Architect.

END OF SECTION 02 270

SECTION 02 282 - TERMITE CONTROL

PART 1 - **GENERAL** Follow the rules and regulations of the **Georgia Structural Pest Control Commission**.

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes soil treatment for termite control.

1.03 SUBMITTALS

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

1.04 Product data and application instructions.

A. Certification that products used comply with U.S. Environmental Protection Agency (EPA) regulations for termiticides.

1.05 QUALITY ASSURANCE

A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for preparing substrate and application.

1.06 Engage a professional pest control operator who is licensed according to regulations of governing authorities to apply soil treatment solution.

A. Use only termiticides that bear a federal registration number of the EPA and are approved by local authorities having jurisdiction.

1.07 JOB CONDITIONS

A. Restrictions: Do not apply soil treatment solution until excavating, filling, and grading operations are completed, except as otherwise required in construction operations.

B. To ensure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

1.08 WARRANTY

A. Warranty: Furnish written warranty, executed by Applicator and Contractor, certifying that applied soil termiticide treatment will prevent infestation of subterranean termites. If subterranean termite activity is discovered during warranty period, Contractor will re-treat soil and repair or replace damage caused by termite infestation.

1.09 Warranty Period: 5 years from date of Substantial Completion.

A. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2- PRODUCTS

Application of approved termiticide.

Approved termiticides shall be those registered by the United States Environmental Protection Agency (EPA) and/or the Georgia Department of Agriculture.

2.01 SOIL TREATMENT SOLUTION

PART 3 - EXECUTION

3.01 APPLICATION

A. Surface Preparation: Remove foreign matter that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placing compacted fill under slabs if recommended by toxicant manufacturer. . Termiticide applications may be made to a school structure only if children or students are not expected to be present in the school structure for a minimum of three (3) hours after application. If the Products label directions specify a longer reentry interval then the longer reentry interval shall apply. In addition to the requirements of Rules 620-3-.02(1) (f) and
620-3-.02(1) (l) all pesticide use records and pesticide use statements for schools shall include the start and completion times, noting AM or PM, for all pesticide applications.

3.02 Application Rates: Apply soil treatment solution as follows:

A. Under slab-on-grade structures, treat soil before concrete slabs are placed, using the following application rates: Under no circumstances shall the concentration applied be lower than the minimum nor greater than the maximum concentration specified on the product label for the Termiticide as a soil termiticide application.

B. Apply 4 gallons of chemical solution per 10 linear feet to soil in critical areas under slab, including entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers.

C. Apply 1 gallon of chemical solution per 10 sq. ft. as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel. Apply 1-1/2 gallons of chemical solution to areas where fill is washed gravel or other coarse absorbent material.

D. Apply 4 gallons of chemical solution per 10 linear feet of trench for each foot of depth from grade to footing, along outside edge of building. Dig a trench 6 to 8 inches wide along outside of foundation to a depth of not less than 12 inches.

Punch holes to top of footing at not more than 12 inches o.c. and apply chemical solution. Mix chemical solution with the soil as it is being replaced in the trench.

E. Post signs in areas of application to warn workers that soil termiticide treatment has been applied. Remove signs after areas are covered by other construction.

F. Reapply soil treatment solution to areas disturbed by subsequent excavation, landscape grading, or other construction activities following application.

END OF SECTION 02 282

SECTION 02 500 – STORM SEWERS AND DRAINAGE STRUCTURES

PART 1 - GENERAL

1.01 QUALITY ASSURANCE:

A. Applicable Standards:

1. General: Current editions or revisions of the following specifications and standards shall apply unless specifically noted otherwise on the Drawings or specified herein. Modifications to standard specifications shall be noted within the Specification and will be noted as revisions to the standard specifications, but will not nullify unaffected portions of the specifications.

2. American Water Works Association: Comparable standard specifications for the American Water Works Association, herein referred to as AWWA, and the American National Standards Institute, herein referred to as ANSI, are listed below:

AWWA	ANSI	Title
C104	A21.4	Cement-mortar lining for Cast-Iron and Ductile-Iron Pipe and Fittings for Water
C110	A21.10	Gray-Iron and Ductile-Iron Fittings, 3 in. through 48 in., for Water and Other Liquids
C111	A21.11	Rubber Gasket Joints for Gray-Iron and Ductile-Iron Pressure Pipe and Fittings
C150	A21.50	Thickness Design of Ductile-Iron Pipe

3. American Society for Testing and Materials: Comparable standard specifications for the American Society for Testing and Materials herein referred to as ASTM, and the American Association of State Highway and Transportation Officials, herein referred to as AASHTO, are listed below. Where only one specification number is shown, the standard specification for that society shall apply.

ASTM	AASHTO	Title
A 36		Structural Steel
A 47		Malleable Iron Castings
A 48		Gray Iron Castings
C 5		Quicklime for Structural Purposes
C 32	M 91	Sewer Brick (Made from Clay or Shale)
C 76	M 170	Reinforced Concrete Culvert, Storm

		Drain, and Sewer Pipe
C 144	M 45	Aggregate for Masonry Mortar
C 150		Portland Cement, Type II
C 443	M 198	Joints for Circular Concrete Pipe Using Rubber Gaskets
C 478	M 199	Precast Reinforced concrete Manhole Sections.

4. Federal Specification SS-S-00210: Sealing Compound, Preformed Plastic for Pipe Joints.

B. Exception: Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (ASTM C76; AASHTO M170).

1. Casting: Reinforced concrete pipe shall not be horizontally cast and externally vibrated.

2. Surface: The surface of the pipe both inside and outside shall have a smooth uniform finish free of holes caused from air bubbles and free of crushed patches of aggregate.

3. Reinforcing Steel: Reinforcing steel shall be completely covered with concrete.

4. Lifting Holes: Lifting holes are not allowed.

5. Joints: Mortar joints are not allowed.

C. Certification of Specification Requirements: The Contractor shall submit to the Engineer a certificate of compliance that the material which is to be furnished meets all requirements of the applicable referenced AASHTO and ASTM specifications. Any testing required for such compliance will be at the expense of the Contractor. Submission and acceptance of the certificate does not necessarily imply acceptance of the pipe furnished. Acceptance of the pipe furnished will be at the discretion of the Engineer.

1.02 PRODUCT HANDLING, DELIVERY AND STORAGE:

A. Pipe and Precast Units shall not dropped, rolled or dragged during unloading, storage or installation. Damaged material will not be acceptable for installation and shall be replaced at no additional cost.

B. Pipe and Joints shall be properly stored to prevent damage.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Abbreviations for Storm Sewer pipe shall be as follows:

Pipe Description	Abbreviation
Reinforced Concrete Sewer Pipe (Class III)	R.C.P.
Ductile Iron Pipe	D.I.P.
Type 2-Aluminized Corregated Metal Pipe	C.M.P.
Bitumunous Coated Corregeated Metal Pipe	B.C.C.M.P.

B. Concrete shall meet the requirements of Division 3.

C. Reinforced Concrete Pipe shall conform to the requirements of ASTM C76 except as modified in these specifications.

D. Ductile Iron Pipe shall conform to the requirements of AWWA standard specification sections C104, ClIO, Clll and C150.

E. Aluminized Steel Pipe Type 2 shall meet or exceed Requirements of AASHTO M-274-791 and M-36.

F. Bitumunous Coated Corregated Metal Pipe shall conform to the requirements of the Georgia Department of Transportation Specifications, latest edition.

G. Joint Material shall meet the referenced standard specifications or as modified in these specifications or on the drawings.

1. Concrete Pipe: Gaskets shall be handled in accordance with the manufacturer's recommendations except as modified herein. Gaskets and jointing materials shall be stored in a dry place out of the direct range of the sun and not left inside the pipe prior to installation. Gaskets exposed to sun and weather will not be installed.

H. Precast Concrete Manholes: Five inches minimum wall thickness, top slab, all conforming with requirements ASTM C478.

1. Joint for Precast Manhole Sections: Preformed plastic, Type 1, Rope Form, conforming with requirements of Federal Specification SS-S-00210.

2. Top slab shall be designed to withstand a 16,000-lb. wheel load.

2.02 IDENTIFICATION:

A. Concrete Pipe: Each piece of pipe shall be marked on the inside of the barrel to make it easily identifiable as to the following:

1. Date of manufacture.
2. Place of manufacture, name of manufacturer.
3. Class of pipe.
4. Inside Diameter of pipe.
5. Type of cement used in manufacture.

PART 3 - EXECUTION

3.01 PREPARATORY WORK:

A. Inspection: The Contractor shall inspect all materials prior to installation so that material not conforming to these specifications shall not be installed; in addition, the Engineer's decision as to acceptability is binding. Removal, repair or adjustment of unspecified materials will be the responsibility of the Contractor at no additional cost.

B. Trenching and Dewatering: Reference Sections 02200 and 02220.

C. Field Engineering: Reference Section 02000.

3.02 INSTALLATION:

A. Pipe: All pipe shall be laid in accordance with manufacturer's special instructions and as specified in this Specification, and as shown on the plans.

1. Trench: Place all pipe and accessories in substantially dry trenches conforming to the lines and grades as shown on the Drawings or as established by the Engineer. Do not allow water to submerge any portion of the joint. Pipe bedding shall be as detailed on the drawings. Form bottom of trench to provide a firm bearing throughout each pipe length. Prepare bell holes in trench to avoid stress concentrations in the pipe bell. Depth of trench should be adequate to provide three feet (3'-0") minimum cover above top of pipe unless specified otherwise on the plans.

2. Lowering Pipe: Do not drop pipe or accessories into trenches. Carefully lower materials, piece by piece. For gravity sewers, commence installation at the lowest point with bell or groove end upgrade. For pressure lines, install spigot end pointing in the direction of primary flow. Replace any materials damaged during the lowering operation.

3. Open Ends: Fully protect open ends of pipe with a stopper to prevent earth or other materials from entering the pipe during the construction period. Type of stopper subject to Engineer's approval.

4. Interior of Pipe: Carefully free dirt, cement and other deleterious materials from interior of pipe as the work progresses.

B. Joints: All pipe joints shall be made water tight and in accordance with the manufacturer's special instruction and as specified below. Cement mortar joints will not be allowed. Joint materials shall conform to previously referenced ASTM and AASHTO Standards. Special care shall be taken in the installation of joints to avoid damage to spigots, bells, gaskets, or other portions of the pipe.

1. Concrete Pipe: The pipe shall be aligned with the previously installed pipe, and the joint pulled together. If the gasket or joint material can be seen or becomes loose when the joint is pulled to within one inch of closure, the pipe shall be removed and the joint remade to the satisfaction of the Engineer. Closure of joints shall be as tight as possible. Joint openings greater than one quarter of the bell depth require that the pipe be re-laid, regardless of when the joint opening is discovered.

C. Class: Class III concrete pipe will be used at all locations unless noted otherwise on the Drawings. Where ductile iron pipe is required Class 51 shall be used unless noted otherwise.

D. Drainage Structures:

1. Concrete used in construction of the drainage structures is to have a compressive strength of not less than 4000 psi.

2. Bitumunous Coated or Aluminized Corregated Metal Pipe: The pipe joints shall be made with bitumunous coated band clamps and O-ring gaskets.

3. Infiltration: Unless otherwise shown on the Drawings, leakage and infiltration must not be greater than 200 gal./in. of diameter/day/ mile. Make an inspection for infiltration during period when the ground water table is high, such as after a rain of several days duration. Repair all leaks to the satisfaction of the Engineer at no additional cost to the Owner.

End of Section

SECTION 02 510 - ASPHALT PAVING

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This section covers asphalt paving.
B. Aggregate and Crusher Run to be supplied by Owner and installed by Contractor.
C. Aggregate Supplier: Vulcan Materials, Marty Eastin, (770) 454-3627.

1.02 SUBMITTALS:

Material Certificates: Provide materials certificates signed by asphalt producer and Contractor, certifying that materials comply with specified requirements.

1.03 JOB CONDITIONS:

A. Weather Limitations: Apply prime and tack coats when ambient temperature is above 50 deg F, and when temperature has not been below 35 deg F for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

B. Construct asphalt concrete surface course when atmospheric temperature is above 40 deg F, and when base is dry.

C. Grade Control: Establish and maintain required lines and elevations.

D. Traffic Control:

1. Maintain vehicular and pedestrian traffic during paving operations, as required for other construction activities.
2. Provide flagmen, barricades, warning signs and warning lights for movement of traffic and safety and to cause the least interruption of work.

1.04 QUALITY CRITERIA:

Industry Standard: Georgia Department of Transportation (D.O.T.) Standard Specifications for Construction of Roads and Bridges, 1983 Edition.

PART 2 - PRODUCTS

2.01 PAVING MATERIALS:

A. Graded Aggregate: Meeting Georgia D.O.T. Specifications, Section 815.
Material supplied by owner. Refer to Article 6.

B. Intermediate Aggregate: Meeting Georgia D.O.T. specifications for Type "B" hot-mixd asphaltic concrete. Material supplied by owner. Refer to Article 6

C. Surface Aggregate: Meeting Georgia D.O.T. specifications for Type "E" hot-mix asphaltic concrete.

D. Base Course: Crusher-run. Material supplied by owner. Refer to Article 6

2.02 MARKING PAINT:

Traffic Lane Marking Paint: Chlorinated rubber base, factory mixed, quick drying, non-bleeding, white color.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION:

A. Base Course: Place 1/2 thickness of base course material over areas to receive paving when sub-grade preparation is complete. Top dress with additional material as required during construction and just before paving work begins, to bring base course up to full, uniform design thickness.

B. Remove loose material from compacted base surface immediately before applying prime coat.

C. Proof roll prepared base surface to check for unstable areas and areas requiring additional compaction.

D. Notify Contractor of unsatisfactory conditions. Do not begin paving work until deficient base areas have been corrected and are ready to receive paving.

E. Prime Coat: Apply at rate of 0.20 to 0.50 gal. per sq. yd., over compacted subgrade. Apply material to penetrate and seal, but not flood, surface. Cure and dry as long as necessary to attain penetration and evaporation of volatile.

F. Tack Coat: Apply to contact surfaces of previously constructed asphalt or portland cement concrete and surfaces abutting or projecting into asphalt pavement. Distribute at rate of 0.05 to 0.15 gal. per sq. yd. of surface.

G. Allow it to dry until at proper condition to receive paving.

3.02 PLACING MIX:

A. General: Place asphalt concrete mixture on prepared surface spread and strike-off. Spread mixture at minimum temperature of 225 deg F (107 deg C). Place inaccessible and small areas by hand. Place to required grade, cross-section, and compacted thickness.

B. Paver Placing: Place in strips not less than 10' wide, unless otherwise acceptable to Architect. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.

C. Joints: Make joints between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density and smoothness as other sections of asphalt concrete course. Clean contact surfaces and apply tack coat.

3.03 ROLLING:

A. General: Begin rolling when mixture will bear roller weight without excessive displacement. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.

C. Second Rolling: Follow breakdown as soon as possible, while mixture is still hot. Continue rolling until mixture has been thoroughly compacted.

D. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

E. Compaction: Compact paving base course material to the following percentages of maximum density in accordance with Standard Proctor ASTM D698:

1. DOT paving: 100 percent.
2. On site paving: 98 percent.

F. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut-out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

3.04 CLEANING AND PROTECTION:

A. At completion of each operation, remove excess or spilled materials from site. Do not dump or spread excess asphalt materials on project site.

B. After placement of surface course, do not permit vehicular traffic on pavement until it has cooled and hardened and in no case sooner than 12 hours.

3.05 FIELD QUALITY CONTROL:

A. General: Test in-place asphalt courses for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Architect.

B. Thickness: In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:

1. Base Course: 1/4", plus or minus.

2. Intermediate Course: 1/4", plus or minus
3. Surface Course: 1/4", plus or minus.

C. Surface Smoothness: Test finished surface of each asphalt concrete course for smoothness, using 10' straightedge applied parallel with, and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness.

1. Base Course Surface: 1/4".
2. Intermediate Course: 1/4"
3. Wearing Course Surface: 3/16".

END OF SECTION 02 510

SECTION 02 518 - WELLS AND PUMPS

PART 1 GENERAL

1.1 SCOPE OF WORK

A. The work provided within this specification includes complete pumping system which shall be provided in accordance with all local and state codes and regulations.

1.2 SUBMITTALS

A. Submit the following Shop Drawings and Submittals listed below for review by the Architect. Submittals shall indicate conformance with the specifications or provide certification of meeting those requirements.

1. Pump Package
2. Control Panel
3. Fittings
4. Basin and Cover
5. Liquid Level Controller

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Sewage Pumps System

1. One (1) Weil Pump Co. series 2613 duplex "Quick-Remove" pumping system consisting of but not limited to; two submersible pump/motor assemblies, "Quick-Remove" fittings, automatic liquid level control, basin, basin cover and all necessary appurtenances required for a properly operating pumping system.

    a. Pumps shall be solid handling type and shall be removable from sump pit without the need for personnel entering the pit or the removal of any fasteners.

    b. Pump motors shall be minimum of the 5 H.P. and shall operate at a maximum speed of 1,750 R.P.M., and be suitable for operation on current as specified under Section 16000of these specifications or as specified by the approving engineer.

        1. Motors shall be housed in a watertight cast iron shell and shall be of the air filled design for maximum efficiency and shall have class AF@ insulation.
        2. Oil filled motors will not be acceptable.
        3. Motor end bell shall be designed as a terminal box and separated from the motor shell by a combination bearing support and inspection plate which shall permit viewing and access to the motor from the topside of the unit.

    c. Pumps shall be furnished with an upper and lower permanently lubricated double-sealed ball bearings, L10 rated, having a rated life of 17,500 hours.

1. Motors using sleeve type bearings in either position will not be acceptable. Motors shall be of the design that are warranted without the need of moisture sensing electrodes.
2. The mating surfaces between the motor end bell, motor shell, and seal housing shall be sealed by means of "O" rings.
3. Motor shaft shall be 316 stainless steel with keyway for positive positioning of the impeller. Pump shall be centerline discharge with mating flange for attaching to the slide rail bracket.
4. Each pump shall be furnished with 25 feet of type SO neoprene jacketed cable. The incoming power cable wires shall be spliced in the combination end bell terminal box.

d. The impeller shall be multi-vane SEMI-OPEN type capable of passing a sphere of 3" and shall be constructed of cast iron and accurately machined to the proper diameter and be statically and dynamically balanced, and shall not require the use of wear rings to insure proper operation.

e. Pumps shall incorporate a tandem mechanical seal system. The upper seal assembly shall be housed in a seal chamber filled with clean biodegradable oil.

f. The upper seal faces shall be carbon against ceramic with the lower seal faces of silicon carbide.

g. The pump casing shall be constructed of cast iron.

h. Each pump shall have capacity as scheduled and shall be Weil Pump Co. Model no. 4-2535-5.

2. One (1) set of "Quick-Remove" fittings for each pump consisting of: galvanized steel guide poles, when basin depths exceed 20'-0" intermediate guide pole braces shall be provided, stainless steel lifting cable, pump mounted connecting yoke, cast iron flanged floor discharge elbow with integral anchor feet and designed to furnish perfect alignment, and to allow positive locking and sealing between the pump mounted connecting yoke and the floor discharge elbow assembly. The floor discharge elbow assembly shall be anchored to the basin floor with stainless steel bolts and nuts.

3. Liquid Level Controller shall be designed for controlling a duplex pumping system and shall be of the tether design consisting of:

a. (4) single pole mercury float switches,
One switch for high water alarm service,
Each switch encapsulated in a chemical resistant polypropylene casing,
b. (4) corrosion resistant switch brackets for attaching the switches to the suspension rod,
c. 1" IPS galvanized steel pipe suspension rod, and wall mounted suspension rod mounting plate.
d. Each switch shall be provided with a 20-foot long power cable.
e. Systems utilizing a free hanging float suspended from the float power cords will not be acceptable.

B. Control Panel

1. Furnish A Weil Pump Co. no 8151 pad lockable IEC duplex pump control panel for remote mounting in a NEMA 4Xrated fiberglass reinforced polyester enclosure suitable for indoor/outdoor use; and shall be furnished with;

    (1) main disconnect through-the-door with door interlock (pad lockable in the off position),
    (2) motor circuit protectors (Class 10) field adjustable,
    (2) magnetic contactors,
    (2) T-O-A selector switches on panel door with spring return to off from test,
    (2) green pilot lights (indicates power to pump motor)
    (1) electric alternator,
    (1) control circuit transformer with fused primary & secondary, numbered and wired control terminal strip, a 4" high water alarm horn (105dB) mounted on side of panel with silencing switch mounted on panel door, a Lexan, red flashing high water alarm dome light mounted on top of panel (Light shall remain on until malfunction has been corrected),
    (1) normally open, dry type, isolated alarm contact.

C. Basin cover shall be prefabricated of reinforced concrete, a minimum of 8" thick, and be compatible with the basin specified above. The cover manufacturer shall provide an opening to accommodate the access hatch as specified herein after.

1. Aluminum frame and access door for mounting in concrete basin cover as hereinbefore specified.

    a. The access door shall be hinged and be furnished with a locking mechanism and drop handles for lifting the access door.
    b. Assembly shall have a live load rating of 300-lbs/sq. ft..
    c. Access door for valve box shall be similar.
    d. All access doors shall be provided with padlocks by the contractor.

2. The Basin shall be prefabricated concrete and shall 60" I.D. X depth as indicated on the drawings, with a full concentric opening. Basin wall thickness shall be not less than 6", and a base thickness of not less than 6". Where the riser sections of the basin are joined together there shall be provided an appropriate seal to prevent leakage.

    a. Basin shall be manufactured to AASHTO HS20 standards.
    b. Openings shall be provide at locations indicated and contractor shall caulk all piping connections to the basin.

PART 3 EXECUTION

3.1 INSTALLATION

A. Installer must specialize in performing work of this section and be approved by the Manufacturer.

B. Installation shall be in accordance with Manufacturer's standards.

C. The initial start-up of the sewage pumping system shall be performed by a qualified factory representative of the pump manufacturer.

D. The factory representative shall supervise the start-up and instruct owner's personnel in the proper operation and maintenance of the sewage pumping system.

E. Provide two copies of completed instruction covering the operation and maintenance of the installed system, including circuit drawings and wiring diagrams of the system as actually installed. A complete list of part numbers and names, together with the nave of the Manufacturer, shall be included in each manual.

3.2 TESTS AND REPORTS

A. Final Acceptance
1. The system will be accepted only after a satisfactory test of the entire system has been accomplished by a factory-trained distributor in the presence of a representative of the Authority Having Jurisdiction and Owner's Representative.

B. On-Site Services
1. Provide the on-site services of an authorized technical representative of the Manufacturer to supervise all connections and fully test all devices and components of the system as installed. Owner's representative shall be instructed in the proper use and testing of the system.

3.3 WARRANTY

A. Warrant the completed sewage pump system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of the complete and certified test or from the date of first beneficial use.

B. The pump manufacturer shall provide a written warranty to warrant the pumps being supplied to the owner against defects in workmanship and materials for a period of five (5) years under normal use, operation and service.

C. The Equipment Manufacturer shall make available to the Owner a maintenance contract proposal to provide a minimum of two (2) inspections and tests per year.

END OF SECTION

SECTION 02 520 - CONCRETE WALK, PAVING, CURB & GUTTER

PART 1 - GENERAL

1.01 DESCRIPTION

A. The extent of concrete walks, paving, and curb and gutters is shown on the drawings.

1.02 RELATED WORK

A. Section 02200: Earthwork

1.03 QUALITY ASSURANCE

A. Codes and Standards: Georgia Department of Transportation Standard Specifications for Highway Construction, 1993 Edition, Section 441; ACI 301 "Specifications for Structural Concrete for Buildings": ACI 318 "Building Code Requirements for Reinforced Concrete"; ACI 347 "Recommended Practice of Concrete Formwork"; ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete"; Concrete Reinforcing Steel Institute "Manual of Standard Practice"; comply with Building Code requirements which are more stringent than the above.

B. Concrete Testing Service: The Contractor will employ a testing laboratory to perform concrete testing during construction. All concrete testing shall be performed by a laboratory meeting the requirements of ASTM E-329-90, for testing agencies for Concrete as Used in Construction. Specimens shall be taken as follows:

1. A set of 4 test cylinders shall be taken on each type and class of concrete per standard recommended practice for each day's pour up to 100 cubic yards. A second set shall be taken for 100 cy to 200 cy, and a third set for more than 200 cy that are poured in any one sequence. Two cylinders out of each set will be tested at seven days and the other two at twenty eight days.

2. Mix designs shall be prepared and reported by a testing laboratory engaged by, and at the expense of the Contractor.

3. Optimum slump desirable is 3", not to exceed 4", unless otherwise specified. Written approval by the Designer is required for the use of concrete with a slump different from that specified. The testing laboratory shall furnish all materials & labor & shall make all field test cylinders and slump measurements associated with the taking of test cylinders. The Contractor shall maintain on the job a slump cone for determining slump characteristics of concrete. Slump determinations shall be made by the Contractor whenever there is a question about the consistency of the concrete or when so directed by the Designer. Concrete having a slump in excess of 4" shall be removed from the job site.

C. Materials and Installed Work: If the concrete test described above indicates that further testing is required due to a discrepancy with the specification, then the Designer will direct the Contractor to perform such tests a the Contractor's expense.

1.04 SUBMITTALS

A. Manufacturer's Data: Concrete Work: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, joint systems, and others as requested by the Designer.

B. Mix Design: Submit mix design for natural concrete with complete ACI test battery reports for approval. Include admixture data and quantities.

C. Field Mock-ups: Contractor shall erect a full scale mock-up of white and natural concrete sidewalk. Include expansion joints, control joints, broom finish and edge detail for review by the Designer.

1.05 INSPECTION

A. Examine the areas and conditions under which concrete walks, paving and curbs and gutters are to be installed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

1.06 GRADE CONTROL

A. Provide grade stakes as required for all walk, paving and curb and gutter construction not more than 25' apart. Check tops of forms for grade before placing concrete. Provide finish grades to the elevations shown on the drawings. Verify that walks, paving and curb and gutter sections will drain prior to pouring.

1.07 TRAFFIC CONTROL

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Do not interfere with normal traffic on adjacent roadways and parking areas.

PART 2 - MATERIALS

2.01 FORMS

A. Either steel or wood, of size and strength to resist movement during concrete placement and retain horizontal and vertical alignment until removal. Use forms that are clean, straight and free of distortion and defects.

B. Use smooth flexible spring steel forms or laminated boards to form radius bends.

C. Coat forms with a non-staining, clear, form release agent which will not discolor or deface the surface of the concrete.

2.02 REINFORCING BARS

A. Deformed steel bars, ASTM A 615, Grade 60, unless otherwise shown.

2.03 JOINT DOWEL BARS

A. Smooth steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

2.04 WELDED WIRE MESH

A. Welded plan cold-drawn steel wire fabric sheets, ASTM A 185.

2.05 CHAIRS

A. Support mesh on hot dipped galvanized chairs with sheet metal feet.

2.06 COMPRESSIBLE FILLER

A. Premolded, flexible cellular neoprene rubber filler strips complying with ASTM D 1056-91, Grade RE41E1, capable of compression up to 35%. Filler is 1/2" thick and its width is 5/8" less than thickness of adjacent concrete. Install filler in all expansion joints. Install filler in all joints between concrete and adjacent materials.

2.07 BACKER ROD AND PAVING JOINT SEALANT

A. Use closed cell polyethylene foam rod with a diameter slightly large than joint width. Fill joints with self-leveling grey traffic grade sealant. Use Vukem 45 by Mameco, Sonolastic by Rexnord, or Sikaflex-2C SL by Sika Corp. Install in all joints except tooled control joints.

2.08 DESIGN MIX

A. To produce standard weight concrete consisting of Portland cement, aggregate, air-entraining admixture and water to produce the following properties:

1. Compressive Strength: Min. 3000 psi, at 28 days for sidewalks, ramps & pads.
2. Slump Range: 2" to 4" for concrete sidewalks, ramps and pads, and curbing.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. Remove loose material from the compacted aggregate base course surface immediately before placing concrete.

B. Form Construction: Set forms to the required grades and lines, rigidly braced and secured. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage. Place forms in smooth, free flowing curves and tangents as shown on the drawings.

3.02 PLACEMENT

A. Do not place concrete until subgrade and forms have been checked for line and grade by the contractor. Moisten sub-base as required to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around structures or frames, if any, until they have been brought to the required grade and alignment.

B. Place concrete using methods which prevent segregation of the mix, and with as little re-handling as possible. Consolidate concrete along with the face of forms with a vibrator. Consolidate with care to prevent dislocation of reinforcing joint materials.

C. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. Automatic sidewalk and/or curb and gutter machine may be used for placement at Contractor's option, subject to the approval of the Designer. If machine placement is to be used, submit revised mix design and laboratory test results which must meet or exceed the minimums herein specified. Machine placement must produce curbs and gutters and/or sidewalks to the required cross-section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

D. Concrete sidewalks and ramps to be 4" thick with 6 x 6 x 2.9 x 2.9 welded wire mesh.

E. Joints: Construct expansion and control joints true-to-line with face perpendicular to surface of the walk, ramps and pads unless otherwise shown.

F. Expansion Joints: Place as shown on the drawings, 1/2" wide, full depth, with compressible filler and where concrete walks abut pavements, curb & gutter, curb inlet or other fixed structures. Compressible filler is to be set 5/8" below top plane of walk, or ramps and pads. Protect top edge of joint filler during concrete placement. Expansion joints in walks, ramps & pads are to be located opposite each other if practicable. Install bond breaker and paving joint sealant as specified. Expansion joints in curb & gutter shall coincide with expansion joints in adjoining pavement.

G. Control Joint: Between expansion joints, place control joint 5' on center for sidewalks. Form control joints in the fresh concrete by grooving the top portion with a recommended cutting tool and finishing edges with a jointer, 1/4" wide by 1/2" deep. Clean all control joints of excess finish material with a masonry saw. Control joints in curb and gutter shall be at a maximum spacing of 20 ft. and shall coincide with joint spacing in adjoining paving.

3.03 CONCRETE FINISHING

A. After striking off and consolidating concrete, smooth the exposed surface by screeding and floating. Adjust floating to compact the surface and produce a uniform texture. After floating, test surface for trueness with a 10' straightedge.

B. Work edges of concrete walks, ramps and pads and control joints with an edging tool, and round to 1/4" radius.

C. After completion of floating and when excess moisture or surface sheen has disappeared, complete surface finishing. Broom finish by drawing a medium stiff broom across the concrete surface, perpendicular to the line of traffic unless otherwise noted on drawings.

D. Do not remove forms within 48 hours after concrete has been placed. After removal, clean ends of joints and point-up any minor honeycombed areas to the satisfaction of the Owner and the Designer.

E. Concrete curbing shall be finished in accordance with Georgia D.O.T. standard specifations, section 441.03.E.2.C.

F. Curing: Protect and moist cure finished concrete complying with applicable requirements of Division 3, Concrete.

G. Backfilling: Backfill, which is included under Section 02200 is to be placed immediately upon curing of curbs and gutters. Fine grading, also included in Section 02200 is to follow the backfilling operation.

H. Backer Rod and Sealant at joints must be installed in accordance with manufacturer's instructions. Use joint tool to assure uniform depth of rod. Protect fresh sealant from surface damage or dust contamination. Replace all damaged or dirty sealant.

I. Paving Repair and Protection: Repair or replace broken & defective walks, paving, and curbs and gutters as directed by the Owner and the Designer.

1. Protect the concrete work from damage until acceptance of the work. Exclude traffic from walks and curbs and gutters for at least 14 days after placement.
2. Sweep concrete surfaces and wash free of stains, discolorations, dirt and other foreign material just prior to final acceptance.

END OF SECTION 02 520

SECTION 02 580 - PAVEMENT MARKING

PART 1 - GENERAL

1.01 DESCRIPTION

This section covers striping of pavements.

1.02 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

B. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

C. AASHTO M 248 :(1991I) Ready-Mixed White and Yellow Traffic Paints

1.03 SUBMITTALS

A. Equipment Lists:
Lists of proposed equipment to be used in performance of construction work, including descriptive data & notifications of proposed Contractor actions as specified herein.

B. Mixing, Thinning and Application:
Manufacturer's current printed product description and Material Safety Data Sheets (MSDS) for each type paint/color proposed for use.

C. Material Tests:
Certified copies of the test reports, prior to the use of the materials at the jobsite. Testing shall be performed in an approved independent laboratory.

D. Volatile Organic Compound (VOC) Content:
Certificate stating that the proposed pavement marking paint meets the VOC regulations of the local Air Pollution Control District having jurisdiction over the geographical area in which the project is located.

1.04 DELIVERY AND STORAGE

A. All materials shall be delivered and stored in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, and directions, all of which shall be plainly legible at time of use.

1.05 EQUIPMENT

A. All machines, tools and equipment used in the performance of the work shall be approved and maintained in satisfactory operating condition. Hand operated push-type machines of a type commonly used for application of paint to pavement surfaces shall be acceptable for marking small streets and parking areas. Applicator machine shall be equipped with the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Sandblasting equipment shall be

provided as required for cleaning surfaces to be painted. Hand-operated spray guns shall be provided for use in areas where push-type machines cannot be used.

PART 2 - PRODUCTS

2.01 PAINT

A. The paint shall be homogeneous, easily stirred to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of 6 months. Paint for roads and streets shall conform to AASHTO M 248, color as indicated. Pavement marking paints shall comply with applicable state and local laws enacted to ensure compliance with Federal Clean Air Standards. Paint materials shall conform to the restrictions of the local Air Pollution Control District.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. Surfaces to be marked shall be thoroughly cleaned before application of the pavement marking material. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water or a combination of these methods as required. Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed with scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion as directed. Areas of old pavement affected with oil or grease shall be scrubbed with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinsed thoroughly after each application. After cleaning, oil-soaked areas shall be sealed with cut shellac to prevent bleeding through the new paint. Pavement surfaces shall be allowed to dry, when water is used for cleaning, prior to striping or marking. Surfaces shall be recleaned, when work has been stopped due to rain. Where early painting is required on rigid pavements, a pretreatment with an aqueous solution containing 3 percent phosphoric acid and 2 percent zinc chloride shall be applied to prepared pavement areas prior to painting.

3.02 Cleaning Concrete Curing Compounds

A. On new portland cement concrete pavements, cleaning operations shall not begin until a minimum of 30 days after the placement of concrete. Either sandblasting or water blasting shall clean all new concrete pavements. The extent of the blasting work shall be to clean and prepare the concrete surface as follows:

a. There is no visible evidence of curing compound on the peaks of the textured concrete surface.

b. There are no heavy puddled deposits of curing compound in the valleys of the textured concrete surface.

c. All remaining curing compounds is intact; all loose and flaking material is removed.

d. The peaks of the textured pavement surface are rounded in profile and free of sharp edges and irregularities.

e. The surface to be marked is dry.

3.03 APPLICATION

All pavement markings shall be placed as shown on the plans.

A. Paint:
Paint shall be applied to clean, dry surfaces, and only when air & pavement temperatures are above 40°F and less than 95°F. Paint temperature shall be maintained within these same limits. New asphalt pavement surfaces and new portland concrete cement shall be allowed to cure for a period of not less than 30 days before applications of paint. Paint shall be applied pneumatically with approved equipment at rate of coverage specified herein. The Contractor shall provide guidelines and templates as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols. Edges of markings shall be sharply outlined. Paint shall be applied evenly to the pavement surface to be coated at a rate of 105 $\pm$ 5 square feet per gallon.

B. Drying:
The maximum drying time requirements of paint specifications will be strictly enforced to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. If there is a delay in drying of the markings, painting operations shall be discontinued until cause of the slow drying is determined and corrected.

END OF SECTION 02 580

SECTION 02 601 - EXCAVATING, TRENCHING & BACKFILLING FOR UTILITIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section covers the excavation, trenching, and backfilling for all utility systems.

1.02 DENSITY TESTS

A. All trenches 12" or wider, as measured at the top, that are within roadways, or areas to be paved shall be tested for conformance to specified compaction requirements.
   1. These trenches shall be backfilled and compacted to their full depth.
   2. Tests shall be made within each 400 square feet of trench areas for each 12" of lift above top of conduit. Tests taken in one foot lifts shall be staggered.

B. Compaction shall not be less than that specified for the surrounding areas or 90% of the Standard Proctor Tests ASTM D698, whichever is greatest.

PART 2 - PRODUCTS

2.01 SHORING

A. Shoring type, layout, and design shall meet OSHA requirements (see 3.2.A) and shall be the Contractor's responsibility.

PART 3 - INSTALLATION

3.01 EXCAVATION

A. The Contractor shall perform all excavation to the depths shown on drawings. During excavation, materials suitable for backfilling shall be piled a sufficient distance from the banks of the excavation to avoid overloading and to prevent slides and cave-ins. Excavated materials not required for fill or back-fill shall be removed from the site. All excavation shall be made by open cut. No tunneling shall be done.

B. Excavation shall not be carried below the designated level except where special bedding is specified or shown on the drawings. Excess excavation below the designated level shall be backfilled with sand or crushed stone and tamped. Excess excavation for manholes and other structures shall be filled with crushed stone or concrete to the required elevation.

C. Trenches shall be only of sufficient width to provide a free working space on each side of the pipe. To prevent excess pressure on the pipe, the maximum width of pipe trench at the top of the pipe shall not be greater than two feet more than the pipe diameter. If this maximum width is exceeded, the Contractor shall provide concrete bedding. The top portion of the trenches may be excavated with sloping or vertical sides to any width which will not damage adjoining structures, roadways, pavements, utilities or private property.

D. The trench bottom shall be made to conform as closely as possible to the shape of the lower

third of the pipe. Excavation shall be made for joints of all pipes, and shall be of sufficient depth to permit access to the joint for construction and inspection. In no case will the joints be used to support the body of the pipe. Bell holes shall be excavated in the trenches so as to relieve pipe bells of all load, but small enough to insure that support is provided throughout the length of the pipe barrel.

E. Unstable soil shall be removed and replaced with gravel or crushed stone, which shall be tamped.

F. Ground adjacent to all excavations shall be graded to prevent inflow of water.

G. The excavation of the trench shall not advance more than one hundred feet (l00') ahead of the completed pipe work.

H. The Contractor shall remove any water accumulated during excavation.

I. The Owner shall be notified immediately upon encountering site conditions at variance to those indicated and any active or inactive utility encountered but not indicated on the drawings. No work shall be done to correct or incorporate unforeseen conditions until written instructions are issued by the Owner.

3.02 SHORING

A. All excavations shall be properly shored, sheeted and braced or cut back at the proper slope to furnish safe working conditions, to prevent shifting of material, to prevent damage to structures or other work, and to avoid delay to the work, all in compliance with U.S. Department of Labor Safety and Health Regulations for Construction promulgated under the Occupational Safety and Health Act of l970 (PL9l-596) and under Section l07 of the Contract Work Hours and Safety Standards Act (PL9l- 54). Bracing shall be so arranged as not to place any strain on portions of completed work until the general construction has proceeded far enough to provide ample strength.

B. In general, sheeting for pipelines shall not be driven below the elevation of the top of the pipe. If it is necessary to drive sheeting below that elevation, the sheeting shall be cut off at the top of the pipe and the remaining sheeting left in place.

C. Sheeting and bracing shall be removed as the excavation is refilled in such a manner as to avoid caving in the areas or structures. Voids left by withdrawal of the sheeting shall be carefully filled by ramming.

3.03 BACKFILLING

A. Prior to backfilling, all underground piping shall be inspected by the Designer. Trenches shall be backfilled with earth backfill materials placed evenly around and on both sides of the pipe in six-inch (6") maximum layers, and tamped until pipe has cover of not less than twelve inches (l2") above top of pipe. The remaining backfill shall be carried on simultaneously on both sides of the trench in such a manner to avoid side pressures. Water settling shall not be permitted. Any trenches where settlement occurs shall be reopened, refilled and compacted with the surface restored to the specified grade and compaction and smoothed off.

B. Prior to backfilling at manholes and other accessories, all forms, trash and debris shall be removed. Backfill material shall be symmetrical on all sides in 8-inch maximum layers. Each layer shall be moistened and compacted with tampers.

C. Prior to final acceptance of the installations, the Contractor shall refill all sunken trenches and excavations to final grade.

D. Earth backfill shall be free of stones and boulders. Acceptable backfill material may be from excavation or borrowed.

3.04 SUBSURFACE OBSTRUCTIONS

A. Neither the Owner nor the Designer will be liable for any claim made by the Contractor based on underground obstructions being different to that indicated in these Contract Documents or plans.

3.05 REMOVING AND REPLACING PAVEMENT

A. In areas where it becomes necessary to remove the existing pavement in order to install the pipe lines and appurtenances, the Contractor shall perform the work in the following manner:
   1. Before removing any pavement, the pavement shall be marked for cuts neatly paralleling the pipe lines and spaced the width of the trench.
   2. The pavement shall be saw cut and broken along the marked lines. No pavements shall be pulled out by machine until completely broken and separated along the marked cuts.
   3. The pavement adjacent to pipe line trenches must not be disturbed or damaged. If the pavement is disturbed or damaged due to caving ditch banks, or indiscriminate use of construction machinery, the Contractor shall remove and replace the damaged pavement at his expense.
   4. The Contractor shall remove and replace or tunnel under any curb encountered.

END OF SECTION 02 601

SECTION 02 610 - WATER DISTRIBUTION SYSTEM

PART 1 – GENERAL

1.01 DESCRIPTION

A. The work specified in this section consists of furnishing, installing, testing and disinfecting of pipe, fitting and appurtenances for water services lines.

B. Start work only after receiving in writing by owner. Obtain approval not less than 14 days before starting water distribution system.

1.02 QUALITY ASSURANCE

A. Contractor: Contractor and Subcontractor for any part on the work shall be experienced in water line work for not less than 3 years.

B. Manufacturer: Material and equipment shall be standard product of a manufacturer who has manufactured the product for a minimum of 3 years and who provides published data on the quality and performance of the product.

C. Notify Architect for inspection of all piping prior to covering with backfill.

1.03 SUBMITTALS

Contractor shall furnish the Architect a description of all materials before ordering. The Architect will review the contractor's request and approve acceptable materials. Notify owner not less than seven days before hydrostatical testing water lines.

1.04 JOB CONDITIONS

Coordinate installation of the line with site work, other trades and other Contractors.

PART 2 – PRODUCTS

2.01 PIPE, TUBING, FITTINGS AND ACCESSORIES

A. Ductile Iron Pipe:

1. Pipe: ANSI/AWWA C151/A21.51-91 Class 51 or heavier

   a. Joints: ANSI/AWWA C151/A21.51-91 push-on type connector

   b. Lining: Std. thickness; ANSI/AWWA C104/A21.4-90, Sect. 4.8.1

   c. Gaskets: ANSI/AWWA C 111/A21.11-90 standard

2. Fittings and Accessories: ANSI/AWWA C 110/A21.10-87

   a. Joints: ANSI/AWWA C151/A21.51-91

b. Restrained joints: Fully gasketed, mechanical type, ductile iron accessories.

c. Lining: Double thickness; ANSI/AWWA C104/A21.4-90, Section 4.8.2

B. Copper Tubing: (for pipes 3" in diameter or less)

1. Tubing: Annealed; ASTM B88-92, type K
2. Fitting: Flared compression type

2.02 GATE VALVE

A. Capable of withstanding 250 pounds per square inch working pressure and of being opened when operating device is turned counterclockwise.

B. AWWA C500-86, have mechanical joints and double, parallel seated disc gates.

C. Body and Bonnet to be ductile iron.

2.03 SERVICE STOPS

A. Capable of withstanding 200 pounds per square inch working pressure; 85 percent copper, five percent lead, five percent tin, and five percent zinc; water works ground key type having no drain; and have tee handle, flow way, and female iron pipe size connections.

2.04 METER BOX and BACKFLOW PREVENTOR ASSEMBLY

A. Gray iron conforming to ASTM A48-88, Class 20, and have identifying cover.

2.05 VALVE BOX

A. Gray iron conforming to ASTM A48-88, Class 20, extension type having flared base and either screw or slide extension adjustment and, unless otherwise indicated, have water cast on cover.

PART 3 – EXECUTION

3.01 Pipe, fitting, valves, and service stops: Install in accordance with AWWA C600-87.

3.02 HYDROSTATIC TEST

A. Test all new water lines and fittings in accordance with AWWA C600 at 250 pounds per square inch. Repair all leaky joints and continue to repair and retest those joints until pipe passes test.

3.03 DISINFECTING

A. Each section of complete water line shall be disinfected in accordance with AWWA C651-92.

3.04 CITY APPROVAL

A. Fulton County will inspect the work as work progresses. Upon completion of satisfactory disinfecting, the County will approve connection to existing main.

END OF SECTION 02 610

SECTION 02 720 - STORM SEWAGE SYSTEM

PART 1 - GENERAL

1.01 SCOPE

A. The Contractor shall furnish all materials, labor, tools, equipment and perform all operations required for the complete installation of the storm drainage systems as shown on the drawings and called for in the specifications. Materials to be incorporated into the work shall be new and unused, and shall conform to all applicable requirements of these specifications. Submittal and approval of all materials, shop drawings or samples shall be in conformance with these specifications.

1.02 RELATED WORK

A. Section 02601: Excavating, Trenching and Backfilling for Utilities.

B. Section 02200: Earthwork

C. Fulton County Standards.

1.03 SUBMITTALS

A. Submittals shall be made for storm drainage pipes, precast manholes, manhole frames and covers and drop inlet frames and grates.

1. Submittals shall be supported by descriptive materials, published by the manufacturer, to conformance to specification and drawing requirements: model numbers alone will not be acceptable. Data submitted for review shall contain all information necessary to indicate compliance with the specifications.

B. Prior to submitting shop drawings, the Contractor shall review the submittal of compliance with the Contract Documents and place a stamp or other confirmation thereon which states that the submittal complies with contract requirements. Submittals without such verification will be returned without review.

1.04 QUALITY CONTROL

A. Notify Inspector for inspection of all piping prior to covering with backfill.

B. Industry Standards:

1. The numerous industry standards for this section are embedded in the text.

PART 2 - PRODUCTS

2.01 PIPES

A. Reinforced Concrete Pipe

1. Reinforced Concrete Pipe and special fittings used for reinforced concrete culvert, storm drain and sewer pipe shall conform to the latest requirements of ASTM Standard Specifications, Serial Designation C-76. Pipe shall have circumferential reinforcement as required for Class III pipe. Reinforced concrete pipe shall be centrifugally cast or vibrated prebed, horizontally or vertically cast or made on a Packerhead machine and shall be furnished in lengths not less than 4 feet. Reinforced concrete pipe shall have bell and spigot joint suitable for the use of a rubber gasket to be provided as part of this item.

B. Ductile Iron Pipe

1. Ductile Iron Pipe - Ductile iron pipe for stormwater shall be manufactured in accordance with ANSI/AWWA C151/A21.51-91 for centrifugally cast ductile iron pipe. The pipe shall be manufactured of iron of grade 60-42-10. Pipe shall be at least Class 51 or heavier where indicated on the drawings. Minimum allowable wall thickness shall be as follows:

Nominal Dia., Inch.	Minimum Wall Thickness, Inch	Minimum Thickness Class
4	0.32	53
6	0.31	52
8	0.30	51
10	0.32	51
12	0.34	51
14	0.36	51
16	0.37	51
18	0.38	51

2. Pipe shall be furnished in lengths of 18' to 20' and unless otherwise indicated and shall be provided with a compression type slip joint. Gaskets and lubricant shall be supplied with the pipe.

3. Pipe shall be furnished with standard thickness cement lining on the inside with a bituminous seal coat and a bituminous coating on the outside. Cement lining shall conform to ANSI/AWWA C104/A21.4. The exterior of the pipe shall be clearly marked to indicate the manufacturer, date of manufacture, the pipe class and weight. Exterior markings shall also positively identify the pipe as being Ductile Iron. Contractor to remove any and all damaged pipe from the job site as directed by Prime Contractor at no additional cost to the Owner.

4. Fittings: All fittings shall be cast grey iron or ductile iron, cement lined, bituminous coated, manufactured in accordance with ANSI/AWWA C110/A21.10. Fittings shall be furnished with mechanical joints conforming to ANSI/AWWA

C111/A21.11, unless otherwise indicated or directed. All fitting shall be furnished for 250 psi pressure rating.

C. Cleanouts

1. Cleanouts shall conform to Gainesville standards.

2.02 METAL ITEMS

A. Frames and gratings, drop inlets, and manhole frames and covers shall be of cast iron construction.

B. Covers and gratings in driveways and parking areas shall be of medium to heavy duty construction and shall not weigh less than that shown on the drawings.

C. Metal items shall be manufactured by Neenah Foundry Company, U.S. Foundry Company, Higgins Foundry, or approved equivalent by the City of Gainesville.

2.03 PRECAST MANHOLES

A. Precast components shall be precast concrete with a minimum compressive strength of 4000 psi and approved by the City of Atlanta.

B. Precast Components - Precast Concrete Manholes shall consist of precast reinforced concrete sections, an eccentric top section, as required, and a base section.

1. Precast manhole sections shall be manufactured in accordance with ASTM Designation C478-90. The minimum compressive strength of the concrete for all selections shall be 4000 psi. The maximum allowable absorption of the concrete shall not exceed 8% of the dry weight.

2. Joints of the manhole section shall be of the tongue and groove type. Sections shall be jointed using either the O-ring rubber gaskets, or with preformed flexible plastic joint sealer conforming to ASTM C990. The inside joint shall be sealed with cement mortar using the one part Portland cement and two parts clean sand.

3. Each section of the precast manhole shall have not more than two holes for the purpose of handling and laying. These holes shall be tapered and shall be plugged with mortar after installation.

4. The ends of each reinforced concrete manhole riser section & bottom end of the manhole top section shall be so formed that when the manhole risers and top are assembled, they will make a continuous and uniform manhole.

2.04 MANHOLE COVERS AND FRAMES

A. Cast iron manhole frames and covers shall be gray iron, conforming to ASTM A-48. All castings shall be tough close grained, smooth and free form blow holes, blisters, shrinkage, strains, cracks, cold shots and other imperfections. All castings shall be

cleaned and painted before rusting begins. Castings shall be given two coats of bituminous paint in the shop. The frame and cover shall in no case weigh less than 315 pounds complete. The cover alone shall not weigh less than 110 pounds.

2.05 CATCH BASIN FRAMES AND GRATINGS

A. Cast iron catch basin frames and gratings shall be gray iron, conforming to ASTM A-48. All Castings shall be tough close grained, smooth and free form blow holes, blisters, shrinkage, strains, cracks, cold shots and other imperfections. All castings shall be cleaned and painted before rusting begins. Castings shall be given two coats of bituminous paint in the shop.

PART 3 - EXECUTION

3.01 PIPE

A. Trench excavation shall be as specified. The line and grade of the storm sewers shall be as shown on the plans. Pipe lengths shown on the plans are scaled distances. Actual lengths of pipe needed shall be determined in the field. Pipe shall be laid true to line and grade on the trench bottom which shall be uniformly firm throughout its entire length. Pipe which is not in true alignment or which shows any settlement after laying or is damaged shall be taken up and relayed at
the Contractor's expense.

B. Pipe laying shall be commenced at the lowest point. All pipes shall be laid with ends abutting and true to the lines and grades shown on the drawings. Sections shall be fitted and matched so that when laid, they will form a sewer with a uniform invert. Each pipe section shall rest upon the pipe bedding for the full length of its barrel with recesses excavated in the bed to accommodate joints disturbed after installation shall be taken up and relayed.

C. The ends of pipe shall be rigidly supported to prevent any movement before and during construction of end supports. The ends of sections shall be fully and closely jointed and true to the lines and grades given. Each section or joint of pipe shall be securely attached to the adjoining section or joint of pipe.

D. Backfill material shall be placed in 6-inch lifts and compacted to 95 percent maximum density per ASTM 698-91.

3.02 MANHOLE INSTALLATION

A. Precast Base Sections shall be installed on a firm stabilized foundation so prepared to prevent settlement and misalignment. Pipe openings shall be exactly aligned with the pipe entering and leaving the manhole.

B. Rubber ring joints shall be carefully made in accordance with the manufacturer's instructions and generally in the following manner. Bells shall be wiped clean, be free of all dirt or other matter, and liberally lubricated for receiving the spigot ends. The gasket groove and gasket shall be well cleaned and lubricated prior to placing.

C. Cast iron frames and covers shall be set in a bed or mortar and aligned to fit the top section of the manhole. Concrete grade rings shall be used to adjust the top to finished grade.

D. Cast iron frame for the manhole cover shall be set at the elevation and anchored to the masonry. Where manholes are constructed in paved areas, the top surface of the frame and cover shall be tilted to conform to the exact slopes crown and grade of the adjacent pavement.

3.03 STORM SEWER APPURTENANCES

A. Storm sewer appurtenances shall be installed at such locations and to such depths as is indicated on the plans. Structures shall be constructed as detailed on the plans. Care shall be taken in placing backfill over and around connecting pipes so that maximum protection is given to the piping. Tops of gratings and frames shall be brought flush with the finished grade.

3.04 BACKFILL

A. Backfill all storm sewer trenches immediately after pipe is installed, unless other precautions are taken to protect the piping and other structures.

B. Where storm sewers are placed under the roadway, or other paved areas, crushed stone backfill material shall be used as follows: The trench of the pipe shall be cut 6" below the proposed bottom of pipe and shall be cut to a width not to exceed 8" greater than the outside diameter of the pipe. The trench shall be filled to a compacted depth of 6" below the proposed bottom of pipe and shall be cut to a width not to exceed 8" greater than the outside diameter of the pipe.

C. The trench shall be filled to compacted depth of 6" with crushed stone. Additional stone shall be placed & shaped by means of a template to fit the bottom of pipe to a depth of 1/4 the outside dia. of pipe. After the pipe is laid to line and grade, the granular backfill material shall be compacted by vibrator and mechanical tampers.

D. Bedding for ductile iron pipe shall be, at minimum, Type 3 according to ANSI/AWWA C151/A21.51. Bedding for concrete pipe shall be Class C according to the American Concrete Pipe Association.

3.05 FINE GRADING

A. All areas over pipelines and around structures shall be graded smooth and hand raked to meet the elevations and contour shown on the plans. All debris, earth clods or rocks larger than 4" shall be removed from the site.

3.06 STORM SEWER PIPE TESTING

A. Test storm sewers by exfiltration method only if the groundwater table is below the pipe crown, except that, if municipality agrees, sewer having diameter not more than 24" may be tested by low pressure air.

1. Exfiltration test method is as follows:
   a. If standpipe has been filled, maintain water head between 2' & 15' above the highest point in the line being tested. Exfiltration will be that volume of water added to standpipe during a 20-hour period.

   b. If upstream manhole has been filled, measure original water elevation and, after 20 hours, final water elevation; convert difference in elevation to gallons. Head of water shall not be less than two feet above highest point in line being tested nor less than two feet above existing groundwater table, whichever is greater. Exfiltration will be the volume of water calculated from the difference in elevations during a 20-hour period.

2. Low-pressure air test method is as follows:
   a. Clean & wet sections of pipe to be tested before starting an air test.

   b. Plug pipe outlets with a pneumatic plugs capable of resisting internal testing pressures without requiring external bracing.

   c. Immediately following the pipe cleaning and wetting, slowly supply air to plugged pipe until air pressure in the pipe becomes 2.5 psig. Allow at least two minutes for the temperature to stabilize before proceeding except slowly add air to maintain a 2.0 to 2.5 psig pressure. While temperature is stabilizing, spray plugs, pipes, and hoses with soap solution and eliminate air leaks.

   d. After temperature has stabilized, measure time required for pressure to drop from 2.5 psig to 1.5 psig. If measured time exceeds allowable time, pipe will be accepted.

   e. Time, in seconds, for pressure to drop from 2.5 psig to 1.5 psig shall not be less than the following; time for intermediate lengths shall be interpolated:

Length of	Pipe Diameter, In Inches						
Pipe (Ft)	8	10	12	15	18	21	24
25	18	28	40	62	89	121	158
50	35	55	79	126	178	243	317
75	53	83	119	186	267	364	475
100	70	110	158	248	356	485	634
125	83	138	198	309	444	595	680
150	106	165	238	375	510	595	680
175	123	193	277	425	510	595	680
200	141	220	317	425	510	595	680
225	158	248	340	425	510	595	680
250	176	275	340	425	510	595	680
275	194	283	340	425	510	595	680
300	211	283	340	425	510	595	680
350	227	283	340	425	510	595	680
400	227	283	340	425	510	595	680

END OF SECTION 02 720

SECTION 02 730 - SANITARY SEWAGE SYSTEM

PART 1- GENERAL

1.01 DESCRIPTION

A. The Contractor shall furnish all materials, labor, tools, equipment and perform all operations required for the complete installation of the sanitary sewer as shown on the drawings and called for in the specifications. Materials to be incorporated into the work shall be new or unused, and shall conform to all applicable requirements of these specifications. Submittal and approval of all materials, shop drawings or samples shall be in conformance with these specifications.

1.02 RELATED WORK

A. Section 02601: Excavating, Trenching and Backfilling for Utilities.

1.03 SUBMITTALS

A. Submittals shall be made for sanitary sewer pipes, cleanouts and materials. Submittals shall be supported by descriptive materials, published by the manufacturer, to show conformance to specification and drawing requirements; model numbers alone will not be acceptable. Data submitted for review shall contain all information necessary to indicate compliance with the specifications.

B. Prior to submitting show drawings, the Contractor shall review the submittal for compliance with the Contract documents and place a stamp or other confirmation thereon which stated that the submittal complies with contract requirements. Submittals without such verification will be returned without review.

1.04 QUALITY CONTROL

A. Notify Designer for inspection of all piping prior to covering with backfill.

PART 2 - PRODUCTS

2.01 PIPES, FITTINGS AND ACCESSORIES

A. Ductile Iron Pipe:

1. Pipe: ANSI/AWWA C151/A21.51-91 Class 51 or heavier

   a. Joints: ANSI/AWWA C151/A21.51-91 push-on type connector.

   b. Lining: Standard thickness; ANSI-AWWA C104/A21.4-90, Section 4.8.1

   c. Gaskets: ANSI/AWWA C111/A21.11-90 standard

2. Fittings and Accessories: ANSI/AWWA C110/A21.10-87
   a. Joints: ANSI/AWWA C151/A21.51-91

   b. Restrained joints: Fully gasketed, mechanical type, ductile iron accessories.

   c. Lining: Double thickness; ANSI/AWWA C104/A21.4-90, Section 4.8.2.

3. Testing & Inspection: Testing & inspection of all pipes shall be done at the factory with certified copy of test results furnished to designer before any pipe is installed.

B. Cleanouts:

1. Cast iron body screw ferrule with heavy brass threaded countersunk plugs meeting Federal Specification WW-P-401. Use line cleanout that may be rodded both ways.

2.02 METAL ITEMS

A. Frames and gratings, drop inlets, manhole frames and covers shall be of cast iron construction built to the dimension and requirements shown on the drawings.

B. Covers and gratings in driveways and parking areas shall be of medium to heavy duty construction and shall not weigh less than shown on the drawings.

C. Metal items shall be manufactured by Neenah Foundry Company, U.S. Foundry Company, Higgins Foundry, Clow Foundry, or approved equivalent.

PART 3 - INSTALLATION

3.01 PIPE

A. Trench excavation shall be as specified.

B. The line and grade of the sanitary sewers shall be as shown on the plans, with 3' minimum clear cover.

C. Pipe lengths shown on the plans are scaled distances. Actual lengths of pipe needed shall be determined in the field.

D. Pipe shall be laid true to line and grade on the trench bottom which shall be uniformly firm throughout its entire length.

E. Pipe which is not in true alignment or which shows any settlement after laying or is damaged shall be taken up and relayed at the Contractor's expense.

F. Pipe laying shall be commenced at the lowest point. All pipes shall be laid with ends abutting and true to the lines and grades shown on the drawings. Sections shall be fitted and matched so that when laid, they will form a sewer with a uniform invert. Each pipe section shall rest upon the pipe bed for the full length of its barrel with recesses excavated in the bed to accommodate joints distributed after installation shall be taken up and relayed.

G. The ends of pipe shall be rigidly supported to prevent any movement pending and during construction of end supports.

H. The ends of sections shall be fully and closely jointed and true to the lines and grades given. Each section or joint of pipe shall be securely attached to the adjoining section or joint of pipe.

3.02 EXISTING SEWER CONNECTIONS

A. Connect to existing sewers in accordance with local standards and governing requirements. Prevent debris from entering sewers. Confirm existing invert elevations at new sewer connections. Make connections to existing manholes by opening manhole wall, inserting pipe, and filling the wall void around the opening with mortar.

3.03 CLEANOUT INSTALLATION

A. Install cleanout and extension from sewer pipe at grade as indicated. Set cleanout frame and cover in concrete block 12 x 12 x 8 inches deep, except where location is in concrete paving. Set top of cleanout 1 inch above surrounding earth grade or flush with grade when installed in paving.

3.04 BACKFILL

A. Backfill all sanitary sewer trenches immediately after pipe is installed, unless other protection for the pipe is provided. Backfilling operations shall be performed with caution to protect the piping and other structures.

B. Where sanitary sewers are placed under the roadway, or other paved areas, crushed stone backfill material shall be used as follows: The trench for the pipe shall be cut 6" below the proposed bottom of pipe and shall be cut to a width not to exceed 8" greater than the outside diameter of the pipe. The trench shall be filled to a compacted depth of 6" below the proposed bottom of pipe and shall be cut to a width not to exceed 8" greater than the outside diameter of the pipe. The trench shall be filled to compacted depth of 6" with crushed stone. Additional stone shall then be placed and shaped by means of a template to fit the bottom of the pipe to a depth of 1/4 the outside diameter of the pipe. After the pipe is laid to line and grade, the granular backfill material shall be compacted by a vibrator and mechanical tampers.

C. Fine grading: All areas over pipelines and around structures shall be graded smooth and hand raked to meet the elevations and contour shown on the plans. All debris, earth clods or rocks larger than 4" shall be removed from the site.

3.05 INSPECTION

A. Sewer Cleaning: Flush sanitary sewers and manholes with water in sufficient volume to obtain free flow through each line. Remove obstructions and correct defects.

B. Leakage Tests: Test each sanitary sewer service line. Repair all visible leaks regardless of whether leakage tests are within the allowable limits. Keep accurate log of tests and provide to the Designer a record copy.

C. Inspections: The Contractor shall arrange for and conduct tests and inspections required by governing local and State agencies. Perform tests during construction.

END OF SECTION 02 730

SECTION 02 810 - IRRIGATION

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The work covered by this Section includes all labor, equipment, and materials required to furnish and install an underground sprinkler system as specified herein and as shown on the Contract Drawings.

B. The extent of the work is shown on the Drawings. In his bid, the Contractor shall confirm all material and product quantities shown on the Drawings.

C. The Contractor shall completely familiarize himself with the site conditions and the requirements of the Contract prior to bidding the work in this Section.

D. All work specified in this Section shall be performed by a qualified Contractor.

E. All work and materials shall be in accordance with applicable codes.

1.02 RELATED WORK UNDER SEPARATE CONTRACT, BY OTHERS, OR ELSEWHERE

A. Electrical stub-out for irrigation controller.

B. Water tap and installation of water meter.

C. The work covered under this section shall include all permits, fees, taxes, insurance, labor, materials, tools, equipment, and expertise to properly execute all work identified or implied by the Drawings and the Specifications.

D. Related Work Specified Elsewhere:

1. Refer To Sections 01 710, 01 720 and 01 730.

E. Electrical materials as specified hereinafter and in Division 16, ELECTRICAL.

1.03 REFERENCE STANDARDS

A. Shop drawings and product data shall be submitted to the Architect for approval prior to installation.

B. Two sets of typewritten operation and maintenance instructions shall be submitted to the Owner prior to application for final payment.

C. After completion of the piping installation, the Contractor shall submit one (1) mylar reproducible as-built record drawing showing all sprinkler heads, valves, drains, pipelines, control wiring, etc. drawn to scale with dimensions where required.

1.04 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. All work and materials shall be in full accordance with the latest rules and regulations of

safety orders of Division of Industrial Safety; the Uniform Building Code and other applicable laws or regulations, including any local Plumbing Code.

2. Should the Contract documents be at variance with the aforementioned rules and regulations, notify the Architect for instructions before proceeding with work affected.

B. Testing:

1. Preliminary review of completed installation will be made prior to backfilling of trenches and during hydrostatic testing.

2. Final review shall be made in conjunction with the final review of lawn, shrub, and tree planting.

C. Permits and Inspections:

1. Any permits for the installation or construction of any work included under this contract, which are required by any of the legal constituted authorities having jurisdiction, shall be obtained and paid for by the Contractor, each at the proper time.

2. The Contractor shall also arrange for and pay all costs in connection with any inspection and examination required by these authorities.

1.05 SUBMITTALS

A. Prior to bid acceptance, submit certification of installer's experience - identifying a minimum of four (4) previous projects with names of Owners and Architects to the Owner and Architect for approval.

B. The Contractor shall furnish one (1) Manufacturer's service manual the Owner. Manuals may be loose-leaf and shall contain complete exploded drawings of all equipment installed showing components and catalog numbers together with the manufacturer's name and address.

C. The Contractor shall maintain one record set of blueline prints of the sprinkler system in good condition at the site and shall mark on them the exact "Record". The Contractor shall make a daily record of all work installed during each day. Plans shall indicate the location of check valves, gate valves, wire locations, head layout, automatic valves, quick couplers, etc. All irrigation and drainage piping, etc., shall be shown on the prints. Locations should be shown by the triangular system of measurements from easily identified permanent features, such as buildings, curbs, fences, walks, etc. Drawings shall show approved substitutions, if any, of material including Manufacturer's name and catalog number. Upon completion all information noted on prints shall be transferred to a reproducible mylar by the Contractor. Drawings shall be to scale and all information shall be recorded in a neat, orderly way.

1. At the time of the irrigation mainline test, the Contractor shall provide a preliminary set of "Record" Drawings to the Owner/Architect.

2. On or before the date of final inspection, the Contractor shall deliver one (1) reproducible set of mylar and (2) sets of blueline prints of the "Record" Drawings to the Owner . The delivery of the prints shall not relieve the Contractor of the responsibility of furnishing required information that may have been omitted.

D. Substitutions:

1. The Contractor shall use materials as specified on the irrigation drawings. Materials other than that specified will be permitted only after written application by the Contractor

and approval by the Architect prior to bid opening.

2. Substitutions will only be allowed when it is in the best interest of the Owner. All substitutions shall be on an "equal or exceeds" basis only.

3. The installation of any approved substitution is the Contractor's responsibility. Any changes required for installation of any approved substitution must be made to the satisfaction of the Architect and without additional cost to the Owner.

1.06 JOB CONDITIONS

A. The bidder acknowledges that he has examined the site, drawings, and specifications, and the submission of a quotation shall be considered evidence that examinations have been made.

B. Field Conditions:

1. The Contractor shall verify drawings and inspect related work and adjacent surfaces. The Contractor shall report to the Owner/Architect all conditions which prevent proper execution of his work.

2. The exact location of all existing utilities, structures, and underground utilities, which may not be indicated on the drawings, shall be determined by the Contractor, and he shall conduct his work so as to prevent interruption of service or damage to them. The Contractor shall protect existing structures and utility services and be responsible for their replacement if damaged by him.

3. The Contractor shall verify the correctness of all finish grades within the work area to insure the proper soil coverage of the sprinkler system pipes.

C. Coordination:

1. The Contractor shall coordinate the schedule of his activities with the Owner prior to commencing operations.

2. The Contractor shall familiarize himself with other work and shall coordinate his activities with those other contractors in or adjacent to landscape work areas.

3. The Contractor shall give notice to and obtain approval from the Owner's Construction Representative prior to proceeding with any site work covered under this contract.

D. Discrepancies and Unsuitable Conditions:

1. Prior to the start of any operations, the Contractor shall inspect the site to determine its suitability for the work under this contract. In addition, the Contractor shall verify that the work of other contractors is sufficiently complete to permit the work under this contract to be started properly.

2. The Contractor shall notify the Owner and Architect of any discrepancies or unsatisfactory conditions and shall not commence operations until they have been corrected as directed by the Owner.

1.07 MATERIALS STORAGE AND CLEAN-UP

A. The Contractor shall keep the premises free from rubbish and all debris at all times and shall arrange his material storage so as not to interfere with the operation of the project and as directed by the Owner. All unused materials, rubbish, and debris shall be removed from the site.

1.08 COMPLETION AND ACCEPTANCE

A. The completion of the contract will be accepted and Notice of Completion recorded only when the entire contract is completed to the satisfaction of the Owner and the Architect.

B. When the installation is complete, the Contractor shall request (in writing) a final inspection to include the Owner and the Architect. During the final inspection the Architect will prepare a "punch list" of items to be completed, repaired, and/or adjusted.

C. Final Acceptance: Work under this Specification will be accepted by the Owner and Architect upon satisfactory completion of all work including "punch list" items.

1.09 WARRANTY

A. The entire sprinkler system will be unconditionally guaranteed by the Contractor as to material and workmanship, including settling of backfilled areas, for a period of one (1) year following the date of substantial completion of work and he hereby agrees to repair or replace any such defect occurring within that year at his expense.

B. It shall be the Contractor's responsibility to insure complete coverage as specified herein of the areas to be irrigated. During the warranty period the Contractor shall make adjustments as necessary to maintain proper coverage.

C. If, within one year from the date of final acceptance, settlement occurs, and adjustments in pipes, valves, and sprinkler heads, lawn areas or paving are necessary to bring the system, grade, or paving to the proper level of the permanent grades, the Contractor, as part of the work under this contract, shall make all adjustments without extra cost to the Owner, including restoration of all damaged planting, paving, or other improvements of any kind. Restoration work shall conform to original Drawings and Specifications.

D. Should any operational difficulties in connection with the irrigation system develop within the specified guarantee period, which, in the opinion of the Owner may be due to inferior material and/or workmanship, said difficulties shall be immediately corrected by the Contractor to the satisfaction of the Owner at no additional cost to the Owner, including any and all other damages caused by such defects.

1.10 OPERATION AND MAINTENANCE - IRRIGATION SYSTEM

A. The entire irrigation system shall be fully operational at least three (3) days prior to any planting.

B. Operation of the irrigation system shall be confined to hours between 12 midnight and 6:00 a.m.

C. The Contractor is responsible for determining water application rates and timer cycling. The Contractor will instruct the Owner on the operation and programming of the controller and will assist the Owner as necessary in such operations throughout the one year maintenance period. Any adjustments, repairs and initial programming are the total responsibility of the Contractor.

PART 2 – PRODUCTS

2.01 MATERIALS

A. All materials to be incorporated in this system shall be new and without flaws or defects and of quality and performance as specified and meeting the requirements of this system

2.02 WATER METERS

A. Shall be provided and installed by others. Contractor shall verify location and size prior to beginning work. Report any discrepancies to Owner and Architect for further direction.

2.03 BACKFLOW PREVENTER

A. To be as indicated on the Drawings. Contractor to verify size and location prior to beginning work. Report any discrepancies to Owner and Architect for further direction.

2.04 PIPE

A. All piping shall be from virgin parent material. The pipe shall be homogenous throughout and free from visible cracks, holes, foreign materials, blisters, deleterious wrinkles, and dents. All pipe shall be National Sanitation Foundation (NSF) approved.

B. Piping on pressure side of irrigation control valves:

1. Shall be Polyvinyl Chloride (PVC) 1120 with a minimum class rating of 200, sized to maintain a flow velocity of less than five feet (5') per second (FPS).

2. Type I, Grade I, Pressure Rated Pipe.

3. Materials shall meet the requirements set forth in ASTM D-1784-60T.

4. Outside diameter of pipe shall be the same size as iron pipe.

5. Pipe shall be marked at intervals (not to exceed 5') with the following information: manufacturer's name or trade mark, nominal size, schedule, pvc type and grade (i.e., PVC 1120), SDR rating class, working pressure at 73 degrees F., and NSF approval.

6. PVC Type I shall not be threaded.

7. Caution should be utilized in handling Type I pipe due to the possibility of cracking or splitting when dropped or handled carelessly.

8. When connection is plastic to metal, male adapters shall be used. The male adapter shall be and tightened, plus one turn with a strap wrench.

C. Piping on non-pressure side or irrigation control valves shall be: Polyvinyl Chloride (PVC): 1120 with a minimum class rating of 160 psi, NFS approved, sized to maintain a flow velocity of less than five feet (5') per second (FPS).

D. Pipe for sleeving shall be high impact pipe, polyvinyl chloride (PVC) 2210, minimum Schedule 40.

2.05 SOLVENT

A. Solvent for PVC pipe shall be #705 Gray NSF approved as manufactured by Industrial Polychemical Service, Gardena, California, or approved equal.

2.06 FITTINGS

A. Fittings for solvent-weld PVC pipe shall be Schedule 40 or 80, polyvinyl chloride (PVC), Type I, to meet ASTM D2466-73 and D-2467-73 NSF approved. Manufactured by one of the following: Lasco, Anaheim, CA (714/993-1220) or Spears, Sylmar, CA (818/364-1661).

B. Threaded PVC nipples shall be Schedule 80.

2.07 SHUT-OFF VALVES

A. Up to three inches (3") size: 125 pound bronze construction, non-rising stem type, sized to line. "Nibco" #T113 or approved equal, or as specified on the Drawings.

2.08 QUICK COUPLING VALVES

A. Valve and key shall be as specified on the drawings.

B. Furnish two valve keys fitted with three-quarter inch (3/4") swivel hose ells.

C. All quick coupling valve keys and hose swivels shall be of the same manufacturer as the quick couplers.

2.09 VALVE BOXES

A. To be injection-molded of polyesters and fibrous inorganic temperature resistant components. Box and lid to be green, manufactured by one of the following: Ametek, Sheboygen, WI (414/457-9435) or Carson Industries, Inc., LaVerne, CA (818/332-6225).

B. For Remote Control Valves: Shall be rectangular or round in shape and sized to provide adequate clearance to operate and service valve.

C. For Shut-Off Valves and Quick Coupler Valves: Shall be round, approximately nine inches (9") inside diameter by ten inches (10)".

2.10 SPRINKLER HEADS

A. All sprinkler heads shall be pop-up type heads as manufactured by Toro, Inc., as specified on the drawings or approved equal.

2.11 AUTOMATIC CONTROLLER

A. Shall be as Specified on the Drawings.

2.12 RAIN SHUT-OFF DEVICES

A. Shall be as specified on the Drawings.

2.13 ELECTRIC CONDUIT AND FITTINGS

A. Underground plastic conduit shall be Class III, FS W-C1094.

2.14 CONTROL WIRE

A. Wire shall be solid copper wire, UL approved for direct burial in ground. Minimum gauge shall be #14 UF. Common ground wire shall be white.

2.15 SPLICING MATERIALS

A. Splicing materials shall be 3M Direct Bury (DBY) splice kits by 3M Corporation, Austin, TX (512/984-5657) or "Snip-Snap" connector by Imperial, Lenexa, KS (913/469-5700).

2.16 REMOTE CONTROL VALVES

A. Remote control valves shall be electrically operated, normally closed, 24 volt 50/60 cycle, constructed of heavy-duty glass-filled UV-resistant nylon and have stainless steel studs and flange nuts with a diaphragm of nylon reinforced rubber, capable of manual operation, and shall be self flushing. The valve shall have a throttling device for system balancing and shall comply with all code and permitting requirements. Valves shall be as manufactured by The Toro Company or approved equal.

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall carefully schedule his work with all other contractors on site.

B. Sleeves are required wherever piping or electrical wires are placed under paved surfaces. Install sleeves prior to commencement of paving. All sleeves are shown on the drawings and the responsibility of the Contractor unless otherwise noted on the Drawings.

C. No consideration will be given to any design changes. Should any changes be deemed necessary after award of contract, for proper installation and operation of the system, such changes shall be negotiated by the Owner.

D. Lay out work as accurately as possible to drawings. Drawings are diagrammatic to the extent that swing joints (QVC), offsets, and all fittings are not shown.

E. Full and complete coverage is required. Contractor shall make any necessary minor adjustments to layout as required to achieve full coverage of irrigated areas at no additional cost to the Owner.

F. Where piping is shown on Drawings to be under paved areas but running parallel and adjacent to planted areas, the intent is to install piping in planted areas. Do not install directly over another line in the same trench.

G. It shall be the Contractor's responsibility to establish the location of all sprinkler heads in order to assure proper coverage of all areas. In no case shall spacing of sprinkler heads exceed distances shown on the Drawings and/or those specified. Pipe sizes shall conform to those shown on the Drawings. No substitutions of smaller pipe sizes will be permitted, but substitutions of larger pipe sizes may be approved. All pipe damaged or rejected because of defects shall be removed from the site at the time of said rejection.

H. Install irrigation system after completion of site grading, or as otherwise directed by the Architect; the irrigation system shall be installed and completed three days prior to the installation of any planting operations.

3.02 TRENCHING

A. Perform all excavations as required for installation of work included under this specification, including shoring of all earth banks, if necessary. Restore all surfaces, existing underground installation, etc. damaged or cut as a result of excavations, to their original condition.

B. Should utilities not shown on the plans be found during excavations, Contractor shall promptly notify the Owner/Architect for instructions as to further action. Failure to do so will make the Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities. Indicate such utility crossings on the record drawings promptly.

C. Trenches shall be open, vertical sided construction wide enough to provide free working space around work installed and to provide ample space for backfilling and compacting.

D. When two (2) pipes are placed in the same trench, a six inch (6") space shall be maintained between the pipes. The Contractor shall not install two pipes with one directly above the other.

E. Trenches located under paving shall be backfilled with sand (a layer six inches (6") below the pipe and three inches (3") above the pipe) and compacted in layers of 95% compaction ASTM. Depth of trenches shall be sufficient to provide a minimum cover above the top of the pipe as follows:

*12" over non-pressure lateral lines

*12" over non-pressure lateral lines under paving

*12" over control wires

*18" over sprinkler main line

*18" over sprinkler main line under paving

F. The Contractor shall cut trenches for pipe to required grade lines and compact trench bottom to prove accurate grade and uniform bearing for the full length of the line.

G. All laterals and mainline shall be sufficiently sloped to provide positive drainage through drain valves.

H. The Contractor shall be held responsible for any damages caused by these operations and shall immediately repair or replace damaged parts.

3.03 BACKFLOW PREVENTION DEVICE

A. To be as specified on the Drawings.

B. Shall be installed at location specified on plans, in accordance with local codes and manufacturer's latest printed instructions.

3.04 PIPE LINE ASSEMBLY

A. General:

1. Install pipes and fittings in accordance with manufacturer's latest printed instructions.

2. Clean all pipes and fittings of dirt, scales, and moisture before assembly.

3. All pipe, fittings, and valves, etc. shall be carefully placed in trenches. Interior of pipe shall be free from dirt and debris. When pipe laying is not in progress the open ends of pipe shall be closed by approved means.

4. All lateral connections to the main line, as well as other connections, shall be made to the side of the mainline pipe. No connections to the top of the main line shall be allowed.

B. Solvent-Weld Joints for PVC Pipe:

1. Use solvents and methods recommended by pipe and solvent manufacturers.

2. Cure joints a minimum of one hour before applying any external stress on the pipe and at least twenty four (24) hours before placing the joint under water pressure, unless otherwise specified by the manufacturer.

C. Threaded Joints for PVC Pipe:

1. Use Teflon tape on all threaded PVC fittings.

2. Use strap-type friction wrench only. Do not use metal-jawed wrench.

3. When connection is plastic to metal, male adapters shall be used. The male adapter shall be hand tightened, plus one turn with a strap wrench.

D. Laying of Pipe:

1. Pipe shall be bedded in at least two inches (2") of finely divided material with no rocks or clods over one inch (1") diameter to provide a uniform bearing.

2. Pipe shall be snaked from side to side of trench bottom to allow for expansion and

contraction. One additional foot per 100 feet of pipe is the minimum allowance for snaking.

3. Do not lay PVC pipe when there is water in the trench.

4. Plastic pipe shall be cut with PVC pipe cutters or hacksaw, or in a manner so as to ensure a square cut. Burrs at cut ends shall be removed prior to installation so that a smooth, unobstructed flow will be obtained.

5. All plastic to plastic joints shall be solvent-weld joints or slip seal joints. All plastic pipe and fittings shall be installed as outlined and instructed by the pipe manufacturer. The Contractor shall be responsible for making arrangements with the pipe manufacturer for any field assistance that may be necessary. The Contractor shall assume full responsibility for the correct installation.

E. PVC Sleeves and Electrical Conduit:

1. All PVC sleeves shall be a minimum of twice (2x) the diameter of the pipe to be sleeved.

2. All PVC control wire conduit shall be of sufficient size to hold the required quantity of control and common wire.

F. Thrust Blocks:

Concrete thrust blocks shall be provided in the thrust side of the pipe wherever the pipe line:

a. Is larger than 2 1/2" in diameter.

b. Changes direction, as at tees or bends, etc.

c. Dead ends.

d. Any other area where a thrust block is to be expected.

2. See the Drawings for thrust block details.

3.05 IRRIGATION CONTROL VALVES

A. Install control valves in valve boxes - grouping together where practical. Place no closer than twelve inches (12") to walk edges, buildings, and walls.

B. Pressure regulating remote control valves shall be adjusted so that the most remote sprinkler heads operate at the pressure specified.

C. Valves shall be installed as shown in the details and in accordance with manufacturer's instructions and the specifications.

3.06 QUICK COUPLING VALVES

A. Shall be set a minimum of twelve inches (12") from walks, curbs, or paved areas where applicable or as otherwise noted. Quick coupling valves shall be housed in valve boxes.

B. Valves shall be installed on a three (3) elbow PVC Schedule 80 swing joint assembly.

3.07 VALVE BOXES

A. Valve boxes shall be set flush with the finish grade in lawn areas and one half inch (1/2") above finish grade in groundcover and shrub bed areas.

3.08 SPRINKLER HEADS

A. All sprinkler heads within a zone shall have matched precipitation rates.

B. All heads operating on one valve (zone) shall do so at the same pressure.

C. Do not mix different types of heads within a zone.

D. Shrub beds and lawn areas to be on separate valves (zones).

E. Place part-circle pop-up sprinkler heads six inches (6") from edge of adjacent walks, curbs, and mowing bands, or paved area at time of installation.

F. All sprinkler nozzles shall be adjusted for the proper radius and direction of spray pattern. Make adjustments where possible to prevent over-spraying onto walks, pavement, or buildings. When necessary, the contractor shall place heads associated with shrub beds atop a black shrub riser in order to facilitate proper coverage.

G. Sprinkler heads and quick coupling valves shall be set perpendicular to finished grade unless otherwise designated on the drawings.

H. Sprinkler heads shall be installed according to the latest printed manufacturer's instructions.

3.09 DRAIN VALVES

A. Drain valves (located in separate valve boxes) are to be provided at sufficient intervals at the low end of each irrigation zone to provide complete drainage of all piping (mainline and laterals).

3.10 AUTOMATIC CONTROLLER

A. The automatic controller shall be installed at the approximate location shown on the drawings.

B. All local and other applicable codes shall take precedence in connecting the 110 volt electrical service to the controller.

C. Install per local code, manufacturer's latest printed instructions, and as detailed on the drawings.

D. Connect remote control valves to controller in a sequence to correspond with station setting beginning with Stations 1, 2, 3, etc.

E. Affix controller name (i.e., "Controller A") on inside of controller cabinet door with letters minimum of one inch (1") high. Affix a non fading copy of the irrigation diagram to the cabinet door below controller name. Irrigation diagram shall be a reduced copy of the as built drawing and shall show clearly all valves operated by the Controller, showing station number, valve size, and type of planting irrigated.

3.11 CONTROL WIRING

A. All electrical equipment and wiring shall comply with local and state codes and be installed by those skilled and licensed in the trade.

B. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible, and shall have a minimum of eighteen inch (18") cover.

C. Control wire shall be installed to the side of the main line whenever possible. Placement over pipe is not permitted.

D. When more than one (1) wire is placed in a trench, the wiring shall be taped together at intervals of ten feet (10').

E. An expansion curl shall be provided within three feet (3') of each wire connection and at least every 100 feet of wire length on runs of more than 100 feet in length. Expansion curls shall be formed by wrapping as least five (5) turns of wire around a one inch (1") diameter pipe, then withdrawing pipe.

F. Control wire splices at remote control valves to be crimped and sealed with specified splicing materials. Line splices will be allowed only on runs of more than 550 feet, and they must be located in ten inch (10") round splice boxes which are green in color. Use one splice per connector sealing packs.

G. The main line shall have two (2) spare wires installed its entire length and to the automatic controller. Label each end "spare wire".

3.12 CLOSING OFF PIPE AND FLUSHING OF LINES

A. All testing shall be done while the Owner and Architect are present. Submit written request for inspections to the Owner and Architect at least three days prior to anticipated inspection date.

1. Thoroughly flush out all water lines under a full head of water before installing sprinkler heads, valves, quick coupler assemblies, etc. Maintain flushing for a minimum of three minutes at the valve located furthermost from water supply.

2. After flushing, cap or plug all openings to prevent entrance of materials that would obstruct the pipe or clog heads. Leave in place until removal is necessary for completion of installation.

3. Test as specified below.

4. Upon completion of testing, complete assembly and adjust sprinkler heads for proper distribution of water.

5. All sprinkler heads and quick coupling valves shall be set perpendicular to finished grades unless otherwise designated on the drawings, or otherwise specified. Sprinkler heads adjacent to existing walls, curbs, and other paved areas shall be set to grade. Sprinkler heads which are to be installed in lawn areas where the turf has not yet been established shall be set one inch (1") above the proposed finished grade. Sprinkler heads installed in this manner will be lowered to grade when the turf is sufficiently established to allow walking on without appreciable damage. Such lowering of heads shall be done by the Irrigation Contractor as part of the original contract with no additional cost to the Owner.

3.13 TESTING

A. Make hydrostatic test when welded PVC joints have cured as per manufacturer's instructions:

1. Pressurized Mains:

Completely install water meter, mains, isolation valves and control valves. Do not install laterals.

Open all isolation valves.

Fill all lines with water and shut off at meter (source).

Pressurize the main line with air to 70 psi. Monitor gauge for pressure loss for four hours.

Leave lines and fitting exposed throughout testing period.

Leaks resulting from test shall be repaired and tests repeated until the system passes.

Test all isolation valves for leakage.

2. Non-pressure laterals: Test piping after laterals and risers are installed and system is fully operational. Leave trenches open to detect possible leakage.

3.14 INSPECTION

A. The contractor shall maintain proper facilities and provide safe access for inspection to all parts of the work.

B. Irrigation inspection shall consist of a minimum of: Main line pressure test, Coverage test, and Final irrigation inspection.

C. If the specifications, the Owner or Architect's instructions, laws, ordinances, or any public authority require any work to be specifically tested or approved, the Contractor shall give the Owner three days notice of its readiness for inspection.

The Contractor shall be solely responsible for notifying the Owner and Architect where and when such work is in readiness for testing.

E. If any work should be covered up without approval of Owner and Architect, it must be uncovered, if required, for examination at the Contractor's expense.

F. No inspection shall commence without "Record" drawings and without complete previously noted corrections, or without preparing the system for inspection.

3.15 BACKFILLING AND COMPACTING

A. After system is operating and required tests and inspections have been made, backfill excavations and trenches.

B. Backfill for all trenches, regardless of the type of pipe covered, shall be compacted to minimum 95% density under pavements and 85% under planted areas.

C. Backfill material shall be approved soil. Unsuitable materials, including clods and rocks over two inches in size shall be removed from the site.

D. A fine granular material shall be placed initially on all lines with a minimum of three inches cover. No foreign material larger than one-half inch in size shall be permitted in the initial backfill.

E. Trenches located under paving shall be backfilled with sand (a layer six inches below pipe and three inches above the pipe) and compacted in layers of 95% compaction (ASTM).

F. Compact trenches in areas to be planted by thoroughly flooding the backfill.

G. Within all planting and lawn areas the existing six inch layer of topsoil shall be restored to its original condition and finish grade.

H. The Contractor shall dispose of all surplus earth remaining after backfilling as directed on site.

3.15 WINTERIZATION

A. Shut off the water supply to the irrigation system.

B. Remove the backflow preventer, remove water from risers by draining or siphon. Drain all water from backflow preventer and reinstall as per manufacturers latest printed unstructions.

C. Drain all pipe and sprinklers with the use of compressed air. This method should only be attempted by experienced professionals. The air compressor should be attached to the backflow preventer riser(downstream side). Do not blow air through the backflow preventer. The contractor may elect to drain the system via intermittently installed drain valves installed

as per section 3.09.

D. Using the automatic controller (timer), turn on the last valve (drain valve or otherwise) furthest from the backflow preventer. Turn on only one valve at a time. Turn on the compressor and slowly increase pressure – never allowing the air pressure in the system to exceed 50 PSI. Insure also that the system is not subject to the inclusion of any hot air (via the compressor) as hot air may damage plastic pipe and fittings. Allow air to run until only air is coming out of the sprinklers, then turn off that valve. Never turn off all valves while the pressure is running. Repeat as may be necessary.

E. When the complete system has been cleared of water, place the control system in “rain mode” or disconnect the controller completely. Place threaded caps over the open ends of the backflow preventer risers, and any additional open fittings.

D. The Contractor shall dispose of all equipment associated with the winterization process, leaving the system completely closed, covered, and the site neat and free of debris.

END OF SECTION 02 810

SECTION 02 830 - PERMANENT CHAIN LINK FENCE

PART 1 - GENERAL

1.01 WORK INCLUDED

The contractor shall provide all labor, materials and appurtenances necessary for installation of the color chain link fencing system defined herein.

1.02 RELATED WORK

Section 02 520 – Concrete Walk, Paving, Curb and Gutter
Section 03 300 – Case-In-Place Concrete
Section 04 200 – Unit Masonry

1.03 SYSTEM DESCRIPTION

The contractor shall supply a total color chain link fencing system of the design, style and strength defined herein. The system shall include all components (i.e., framework, chain link fabric, gates and fittings) required.

1.04 QUALITY ASSURANCE

The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.05 REFERENCES

A. American Society for Testing and Materials (ASTM) Standards:

A90/A90M	Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
A653/A653M	Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
A924/A924M	Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
B6	Specification for Zinc
B117	Practice for Operating Salt Spray (Fog) Apparatus
D1499	Practice for Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Plastics
D3359	Test Methods for Measuring Adhesion by Tape Test
E8/E8M	Test Methods for Tension Testing of Metallic Materials
F567	Practice for Installation of Chain-Link Fence
F626	Specification for Fence Fittings
F668	Specification for Poly(Vinyl Chloride) (PVC)-Coated Steel Chain-Link Fence Fabric
F900	Specification for Industrial and Commercial Swing Gates
F934	Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials
F969	Practice for Construction of Chain-Link Tennis Court Fence
F1043	Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework

F1184 Specification for Industrial and Commercial Horizontal Slide Gates

B. American Association of State Highway and Transportation Officials (AASHTO) Standards:
M181 Standard Specification for Chain-Link Fence

C. United States Federal Supply Service General Services Administration Specifications:
RR-F-191/3 Federal Specification Sheet for Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces) – Detail Specification

1.06 SUBMITTAL

The manufacturer's literature shall be submitted prior to installation.

1.07 PRODUCT HANDLING AND STORAGE

Upon receipt at the job site, all materials shall be checked to ensure that no damages occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage and to protect against damage, weather, vandalism and theft.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

Framework for color chain link fence systems shall conform to Ameristar® PermaCoat® PC-40™ FencePipe (industrial weight), as manufactured by Ameristar® Fence Products in Tulsa, Oklahoma.

2.02 MATERIAL – STEEL FRAMEWORK

A. The steel material used shall be zinc-coated steel strip, galvanized by the hot-dip process conforming to the criteria of ASTM A653/A653M and the general requirements of ASTM A924/A924M.

B. The zinc used in the galvanizing process shall conform to ASTM B6. Weight of zinc shall be determined using the test method described in ASTM A90 and shall conform to the weight range allowance for ASTM A653, Designation G-210.

C. The framework shall be manufactured in accordance with commercial standards to meet the strength (50,000 psi minimum yield strength) and coating requirements of the following standards:

1. ASTM F1043, Group IC, Electrical Resistance Welded Round Steel Pipe, heavy industrial weight.
2. M181, Type I, Grade 2, Electrical Resistance Welded Steel Pipe
3. RR-F-191/3, Class 1, Grade B, Electrical Resistance Welded Steel Pipe

D. The exterior surface of the electrical resistance weld shall be recoated with the same type of material and thickness as the basic zinc coating.

E. The manufactured framework shall be subjected to the PermaCoat® process, a complete thermal stratification coating process (multi-stage, high-temperature, multi-layer) including, as a minimum, a six-stage pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish.

F. The material used for the base coat shall be a zinc-rich (gray color) thermosetting epoxy; the minimum thickness of the base coat shall be two (2) mils. The material used for the finish coat shall be a thermosetting "no-mar" TGIC polyester powder; the minimum thickness of the finish coat shall be two (2) mils. The stratification coated pipe shall demonstrate the ability to endure a salt-spray resistance test in accordance with ASTM B117 without loss of adhesion for a minimum exposure time of 3,500 hours. Additionally, the coated pipe shall demonstrate the ability to withstand exposure in a weather-ometer apparatus for 1,000 hours without failure in accordance with ASTM D1499 and to show satisfactory adhesion when subjected to the cross-hatch test, Method B, in ASTM D3359. The polyester finish coat shall not crack, blister or split under normal use.

G. The color of all framework shall be black in accordance with ASTM F934.

H. The strength of fencepipe shall conform to the requirements of ASTM F1043; the minimum weight shall not be less than 90% of the nominal weight (see Table 1). The strength of line, end, corner and pull posts shall be determined by the use of 4’ or 6’ cantilevered beam test. The top rail shall be determined by a 10’ free-supported beam . Conformance with this specification can be demonstrated by measuring the yield strength of a randomly selected piece of pipe from each lot and calculating the section modulus. The yield strength shall be determined according to the methods described in ASTM E8. For materials under this specification, the 0.2 offset method shall be used in determining yield strength. Terminal posts, line posts and top/bottom rails shall be precut to specified lengths.

2.03 MATERIAL – FENCE FABRIC

A. The material for color chain link fence fabric shall be manufactured from galvanized steel wire. The weight of zinc shall meet the requirements of ASTM F668, Table 4. Galvanized wire shall be PVC-coated to meet the requirements of ASTM F668. The class of the fence fabric shall be Class 1 – Extruded.

B. Selvage: Top edge knuckled and bottom edge knuckled.

C. Color: The coating color for the fence fabric shall black. Reference ASTM F668 and ASTM F934.

D. Wire Size: The finished size of the coated wire shall be 6 gauge.

E. Height and Mesh Size: The fabric height shall be 6 feet high with a mesh size 2 inches.

2.04 MATERIAL – FENCE FITTINGS

The material for fence fittings shall be manufactured to meet the requirements of ASTM F626. The coating for all fittings shall be the same Permacoat® color coating system required for the framework (see 2.02); the color of all fittings and fasteners shall be black in accordance with ASTM F934. All fasteners shall be stainless steel.

2.05 MATERIAL – GATES

Swing gates shall be manufactured and coated to meet the requirements of ASTM F900. Slide

gates shall be manufactured to meet the requirements of ASTM F1184. The color of all gates shall be black in accordance with ASTM F934.

PART 3 - EXECUTION

3.01 PREPARATION

All new installation shall be laid out by the contractor in accordance with the construction plan.

3.02 INSTALLATION

Install chain link fence in accordance with ASTM F567. Fence posts shall be set at spacings of a maximum of 10’ o.c. Gate posts shall be spaced according to the gate openings specified in the construction plans. The "Paving and Surfacing," "Cast-In-Place Concrete" and "Unit Masonry" sections of this specification shall govern post base placement and material requirements. Install fabric on security side and attach with wire ties or clip to line posts at 15 inches o.c. and to rails, braces and tension wire at 24 inches o.c.

3.03 CLEANING

The contractor shall clean the jobsite of excess materials. Post hole excavations shall be scattered uniformly away from posts.

END OF SECTION 02 830

SECTION 02 831 - ORNAMENTAL METAL FENCING & GATE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The contractor shall provide all labor, materials and appurtenances necessary for installation of the ornamental metal fencing system defined herein.
B. V-Track Slide Gates

1.2 RELATED WORK

A. Section 02 200 - Earthwork
B. Section 03 300 – Cast In Place Concrete

1.3 SYSTEM DESCRIPTION

A. The manufacturer shall supply a total ornamental metal fencing system of the design, style, strength and picket inter-space defined herein. The system shall include all components (i.e., pickets, rails, posts, sliding and man gates and hardware) required.

1.4 QUALITY ASSURANCE

A. The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.5 REFERENCES

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process

B. ASTM A924/A924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot Dip Process

C. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength and High-Strength Low-Alloy with Improved Formability

D. ASTM B117 - Practice for Operating Salt Spray (Fog) Apparatus

E. ASTM D523 - Test Method for Specular Gloss

F. ASTM D822 - Practice For Conducting Tests On Paint and Related Coatings and Materials Using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus

G. ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

H. ASTM D2244 - Test Method for Calculation of Color Differences From Instrumentally Measured Color Coordinates

I. ASTM D2794 - Test Method for Resistance of Organic Coatings to The Effects of Rapid Deformation (Impact)

J. ASTM D3359 - Test Method for Measuring Adhesion by Tape Test

1.6 SUBMITTAL

A. The manufacturer's literature shall be submitted prior to installation.

1.7 PRODUCT HANDLING AND STORAGE

A. Upon receipt at the job site, all materials shall be checked to ensure that no damages occurred during shipping or handling. Materials shall be store in such a manner to ensure proper ventilation and drainage and to protect against damage, weather, vandalism and theft.

PART 2 - MATERIALS

2.1 MANUFACTURER

A. The ornamental metal fencing system shall conform to Ameristar AEGIS II™, ' 2- rail, Classic' style.

B. The gate shall be Series 4000 V-Track Slide Gate as manufactured by Jamieson Manufacturing Company. (888) -286-3362. Refer to drawings for dimensions and gate opening requirements.

2.2 MATERIAL - FENCE

A. The material for fence framework (i.e., pickets, rails and posts) shall be manufactured from coil steel having a minimum yield strength of 50,000 psi. The steel shall be galvanized to meet the requirements of ASTM A526 with a minimum zinc coating weight of .90 ounces per square foot (coating Designation G-90), hot-dip process. Galvanized framework shall be subject to six stage pretreatment/wash (with zinc phosphate) followed by an electrostatic spray application of a two coat powder system. The base coat is a thermosetting epoxy powder coating (gray in color) with a minimum thickness of 2-4 mils. The top coat is a "no-mar" TGIC poyester powder coat finish with a minimum thickness of 2-4 mils. The color shall be black. Coated galvanized framework shall have a salt spray resistance of 3,500 hours using Test Method B117 without loss of adhesion.

B. Material for fence pickets shall be 1" square x 16 Ga. tubing. The cross sectional shape of the rails shall conform to the manufacturer's Forerunner™ design, with outside cross-section dimensions of 1.75" square and a minimum thickness of 14 Ga. Post spacing shall be 71-1/4" for 6' o.c. nominal. Picket holes in Forerunner™ rail shall be space 4.98" o.c. Picket retaining rods shall be 0.125" diameter galvanized steel. Posts shall be a minimum of 2-1/2" square x 12 Ga. High quality PVC gromments shall be supplied to seal all picket-to-rail intersections.

2.3 MATERIAL - GATE

A. Gate Frame:

1) Materials to be in accordance with ASTM F 1184 Type II Class 2.
   a. Grade:
   b. Structural aluminum: 6063-T52 unless otherwise specified.
   c. Size/Weight: 6" V-GROOVE Wheel

2) Construction:

   d. No distinction of left-hand or right hand is necessary in specifying or fabricating this gate.
   e. Primary vertical members to be centered at gate opening and equidistant and not to exceed 6' spacing.
   f. Intermediate Vertical members are to be equidistant between the primary vertical members.
   g. Horizontal tension bracing is provided each end of the panel.
   h. Trussing:
      i. Each bay shall include four (4) 1⁄4" think aluminum gussets welded into each corner of the bay.
      ii. 3/16" stainless steel wire rope is cross trussed diagonally between all primary vertical members and attached to the gusset via galvanized 3/8"x 6" turnbuckles between the wire rope and each bottom corner gusset to allow for adjustment.
      iii. Wire rope shall be secured to the gusset with a single cable thimble and a crimped cable clamp. The overhang shall be braced exactly as the lead front end of the gate and include fabric filler throughout the overall length of the gate as to adhere to ASTM F-2200-2 and U.L. 325 safety standards for gates.

B. Hardware: All gate hardware; guide assemblies and hangers shall be galvanized after fabrication from malleable iron or pressed steel.

C. Gate Frame Finish a. Choice of Natural Aluminum or Polymer Powder Coated to match fence color as specified and approved by the architect.

D. Chain Link Fence Fabric Filler

a. The chain link fabric filler shall be of the approved type and size as specified for the applicable fence project.
b. The chain link fabric filler shall be stretched along the overall length of the gate including the counter balanced area.
c. Assembly:
   i. Attach the fabric to the gate frame by lacing a steel tension bar vertically through the last link of the fabric at both ends of the gate frame.
   ii. The tension bars are secured to the gate frame by attaching a steel tension band around frame and through the last link of fabric containing the tension bar.
   iii. A tension wire shall be stretched and attached along the top and bottom of the fabric filler and attached to the gate frame with tie wires looped through provided slots in each of the aluminum gussets in the corners of each bay. This ensures that the fabric filler is taut and secure thus adding support to the entire gate frame.

E. Gate posts are 4" O.D. schedule 40 weighing 9.11 lb/ft.
a. Gates > 26' require two double post assy. @ 36" spacing and one latch post.

PART 3 - EXECUTION

3.1 PREPARATION

A. All new installation shall be laid out by the contractor in accordance with the construction plans.

3.2 INSTALLATION

A. Fence posts shall be set at spacings of either 71-1/4" or 8' o.c. plus or minus 1/2", depending on the span specified. Gate posts shall be spaced according to the gate openings specified in the construction plans. The "Earthwork" and "Concrete" sections of this specification shall govern post base placement and material requirements. AEGIS II™ panels shall be attached to posts using mechanically fastened panel brackets supplied by the manufacturer.

B. Install posts per manufacturers recommendation.

C. Set posts in concrete. Excavate footing holes having a diameter 4 times the diameter of the post, and 6" deeper than the bottom of the post or otherwise as specified by the engineer. Crown the finished concrete at the top of the grade point to shed water. Posts should be set a minimum depth of 36" for all v-track gates.

D. Check each post for vertical and top alignment.

3.3 GATE INSTALLATION

A. Install gate. Make sure that gate rolls free of binding. B. Attach latch and make sure that gate is received by latch in a secure manner.

3.4 CLEANING

A. The contractor shall clean the job site of excess materials. Post hole excavations shall be scattered uniformly away from posts.

END OF SECTION 02 831

SECTION 02 832 - SEGMENTAL RETAINING WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes single-depth segmental retaining walls with soil reinforcement.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for excavation for segmental retaining walls.
2. Division 3 Section "Cast-in-Place Concrete" for retaining wall footings.
3. Division 4 Section "Unit Masonry Assemblies" for decorative concrete masonry units with faces required to match segmental retaining wall units.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide segmental retaining walls capable of withstanding the effects of gravity loads due to soil pressures resulting from grades indicated, and determined according to NCMA's "Design Manual for Segmental Retaining Walls."

1. Include the effects of sloped backfill as indicated on Drawings.

B. Seismic Performance: Provide segmental retaining walls capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads." NCMA's "Segmental Retaining Walls--Seismic Design Manual."

1. Seismic Design Criteria:
   a. Seismic Use Group – 1
   b. Seismic Site Class – D
   c. Seismic Design Category – C
   d. Seismic Importance Factor 1e = 1.0
   e. Spectral Response Acceleration Coefficient, Sd5=o.260, Sd1=0.170
   f. Response Modification Factor – R = 2.0

C. Drainage: Provide segmental retaining wall drainage system capable of preventing accumulation of groundwater in retained soils and in retaining wall foundation soils.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For installed systems indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Samples for Initial Selection: For concrete units.

C. Samples for Verification: For each color and texture of concrete unit required. Submit full-size units sections of units not less than 3 inches (75 mm) square.

D. Qualification Data: For Installer.

E. Preconstruction Test Reports: For segmental retaining wall system.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for segmental retaining wall units and soil reinforcement.

1. Include test data for freeze-thaw durability of segmental retaining wall units.

G. Product Certificates: For segmental retaining wall units signed by product manufacturer.

1. Include test data for shear strength between segmental retaining wall units according to NCMA SRWU-2.

H. Research/Evaluation Reports: For segmental retaining wall units.

1.5 QUALITY ASSURANCE

A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform the following preconstruction testing:

1. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
2. Test soil reinforcement and backfill materials for pullout behavior according to GRI GG5 or GRI GT6.
3. Test soil reinforcement and backfill materials for coefficient of friction according to ASTM D 5321.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects.

1. Build mockups of typical segmental retaining wall as shown on Drawings.

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store and handle concrete units and accessories to prevent deterioration or damage due to moisture, temperature changes, contaminants, breaking, chipping, or other causes.

B. Store geosynthetics in manufacturer's original packaging with labels intact. Store on elevated platforms, protected from moisture, sunlight, chemicals, flames, temperatures above 160 deg F (71 deg C) or below 32 deg F (0 deg C), and other conditions that might damage them. Verify identification of geosynthetics before using and examine them for defects as material is placed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Segmental Retaining Wall Units:

a. Licensees of Allan Block Corporation.
b. Licensees of Anchor Wall Systems, Inc.
c. Licensees of Geo Western, Inc.
d. Licensees of ICD Corporation.
e. Licensees of Keystone Retaining Wall Systems, Inc.
f. Licensees of Reinforced Earth Company (The).
g. Licensees of Risi Stone Systems; a division of Rothbury International Inc.
h. Licensees of Rockwood Retaining Wall Systems.
i. Licensees of Tensar Earth Technologies, Inc.
j. Licensees of Versa-Lok Retaining Wall Systems; a division of Kiltie Corp.

2.2 SEGMENTAL RETAINING WALL UNITS

A. Concrete Units: ASTM C 1372, Normal Weight, except that units shall not differ in height more than plus or minus 1/16 inch (1.6 mm) from specified dimension.

1. Provide units that comply with requirements for freeze-thaw durability.
2. Provide units that interlock with courses above and below by means of integral lugs or lips pins clips or hollow cores filled with drainage fill.

B. Colors: As selected by Architect from manufacturer's full range.

C. Shapes: Provide units of any basic shape and dimensions that will produce segmental retaining walls of dimensions and profiles indicated without interfering with other elements of the Work and as follows:

1. Exposed Face: Machine-split textured.
2. Batter: Provide units that offset from course below to provide at least 1:24 batter.

D. Cap Units: Provide cap units of same shape as other units with smooth, as-cast top surfaces without holes or lugs.

E. Special Units: Provide corner units, end units, and other shapes as needed to produce segmental retaining walls of dimensions and profiles indicated and to provide texture on exposed surfaces matching face.

2.3 INSTALLATION MATERIALS

A. Pins: Product supplied by segmental retaining wall unit manufacturer for use with units provided, made from nondegrading polymer reinforced with glass fibers.

B. Clips: Product supplied by segmental retaining wall unit manufacturer for use with units provided, made from nondegrading polymer reinforced with glass fibers.

C. Cap Adhesive: Product supplied or recommended by segmental retaining wall unit manufacturer for adhering cap units to units below.

D. Leveling Base: Comply with requirements in Division 2 Section "Earthwork" for base material.

E. Drainage Fill: Comply with requirements in Division 2.

F. Reinforced Soil Fill: ASTM D 2487; GW, GP, SW, SP, and SM soil classification groups or a combination of these groups; free of debris, waste, frozen materials, vegetation, and other deleterious matter; meeting the following gradation according to ASTM C 136: 20 to 100 percent passing No. 4 sieve, 0 to 60 percent passing No. 40 sieve, 0 to 35 percent passing No. 200 sieve; and with fine fraction having a plasticity index of less than 20.

G. Nonreinforced Soil Fill: Comply with requirements in Division 2 Section "Earthwork" for satisfactory soils.

H. Filter Fabric: Comply with requirements in Division 2.

I. Drainage Pipe: Comply with requirements in Division 2.

2.4 SOURCE QUALITY CONTROL

A. Direct manufacturer to test and inspect each roll of soil reinforcement at factory for minimum average roll values for geosynthetic index property tests including the following:

1. Weight.
2. Roll size.
3. Grab or single-rib strength.
4. Aperture opening.
5. Rib or yarn size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for excavation tolerances, condition of subgrades, and other conditions affecting performance of segmental retaining walls.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 RETAINING WALL INSTALLATION

A. General: Place units according to NCMA's "Segmental Retaining Wall Installation Guide" and segmental retaining wall unit manufacturer's written instructions. Lay units in running bond.

1. Form corners and ends by splitting units with mason's hammer and chisel.

B. Leveling Base: Place and compact base material to thickness indicated and with not less than 95 percent maximum dry unit weight according to ASTM D 698.

1. At Contractor's option, unreinforced lean concrete may be substituted for upper 1 to 2 inches (25 to 50 mm) of base. Compact and screed concrete to a smooth, level surface.

C. Leveling Course: Place unreinforced lean concrete over base course to thickness indicated; compact and screed to a smooth, level surface.

D. First Course: Place first course of segmental retaining wall units on leveling base/course for full length of wall. Place units in firm contact with each other, properly aligned and level.
1. Place and compact fill, either drainage or soil fill as indicated, to top of first course. Place fill on both sides of wall at same time without disturbing alignment of units. Fill voids between and within units with drainage fill.

E. Subsequent Courses: Remove excess fill and debris from tops of units in course below. Place units in firm contact, properly aligned, and directly on course below.

1. For units with lugs designed to fit into holes in adjacent units, lay units so lugs are accurately aligned with holes, and bedding surfaces are firmly seated on beds of units below.
2. For units with lips at front of units, slide units as far forward as possible for firm contact with lips of units below.
3. For units with pins, install pins and align units according to manufacturer's written instructions.
4. For units with clips, install clips and align units according to manufacturer's written instructions.
5. Place fill on both sides of wall at same time, where both sides are indicated to be filled.
6. Fill voids between and within units with drainage fill.

F. Cap Units: Place cap units and secure with cap adhesive according to manufacturer's written instructions.

3.3 FILL PLACEMENT

A. General: Comply with requirements in Division 2 Section "Earthwork," NCMA's "Segmental Retaining Wall Installation Guide," and segmental retaining wall unit manufacturer's written instructions.

B. Place, spread, and compact fill in uniform lifts for full width and length of embankment as wall is laid. Begin at back of wall and place and spread fill toward embankment.

1. Use only hand-operated compaction equipment within 48 inches (1200 mm) of wall, or one-half of height above bottom of wall, whichever is greater.
2. Compact drainage fill to not less than 95 percent maximum dry unit weight according to ASTM D 698.
3. Compact reinforced soil fill to not less than 95 percent maximum dry unit weight according to ASTM D 698.

    a. In areas where only hand-operated compaction equipment is allowed, compact to not less than 90 percent maximum dry unit weight according to ASTM D 698.

4. Compact nonreinforced soil fill to comply with Division 2 Section "Earthwork."

C. Place filter fabric against back of wall and place layer of drainage fill at least [**12 inches (300 mm)**] [**6 inches (150 mm)**] deep behind filter fabric to within 12 inches (300 mm) of finished grade. Place another layer of filter fabric between drainage fill and soil fill.

D. Place a layer of drainage fill at least [**12 inches (300 mm)**] [**6 inches (150 mm)**] deep behind wall to within 12 inches (300 mm) of finished grade. Place a layer of filter fabric between drainage fill and soil fill.

1. Wrap drainage pipe with filter fabric and place in drainage fill as indicated.
2. Place impervious fill over top edge of drainage fill layer.

E. Place soil reinforcement in horizontal joints of retaining wall where indicated and according to soil reinforcement manufacturer's written instructions. Embed reinforcement a minimum of 8 inches (200 mm) into retaining wall and stretch tight over compacted backfill. Anchor soil reinforcement before placing fill on it.

1. Place additional soil reinforcement at corners and curved walls to provide continuous reinforcement and to comply with manufacturer's written instructions.
2. Place geosynthetics with seams, if any, oriented perpendicular to segmental retaining walls.
3. Do not dump fill material directly from trucks onto geosynthetics.
4. Place at least 6 inches (150 mm) of fill over reinforcement before compacting with tracked vehicles or 4 inches (100 mm) before compacting with rubber-tired vehicles.
5. Do not turn vehicles on fill until first layer of fill is compacted and second layer is placed over each soil-reinforcement layer.

3.4 CONSTRUCTION TOLERANCES

A. Variation from Level: For bed-joint lines along walls, do not exceed 1-1/4 inches in 10 feet (32 mm in 3 m), 3 inches (75 mm) maximum.

B. Variation from Indicated Batter: For slope of wall face, do not vary from indicated slope by more than 1-1/4 inches in 10 feet (32 mm in 3 m).

C. Variation from Indicated Wall Line: For walls indicated as straight, do not vary from straight line by more than 1-1/4 inches in 10 feet (32 mm in 3 m).

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Comply with requirements in Division 2 Section "Earthwork" for in-place compaction testing.

1. In each compacted backfill layer, perform at least 1 field in-place compaction test for each [**150 feet (50 m)**] or less of segmental retaining wall length.

3.6 ADJUSTING AND CLEANING

A. Remove and replace segmental retaining wall construction of the following description:

1. Broken, chipped, stained, or otherwise damaged units. Units may be repaired if methods and results are approved by Architect.
2. Segmental retaining walls that do not match approved Samples and mockups.
3. Segmental retaining walls that do not comply with other requirements indicated.

B. Replace units so segmental retaining wall matches approved Samples and mockups, complies with other requirements, and shows no evidence of replacement.

END OF SECTION 02 832

SECTION 02 900 – LANDSCAPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work covered under this section shall include all permits, fees, taxes, insurance, labor, materials, tools, equipment, and expertise to properly execute all work identified or implied by the Drawings and the Specifications prepared by the Landscape Architect for the implementation of all landscape improvements.

B. Work shall begin within 20 days of written notification from Owner to proceed and shall be completed as per the schedule indicated in the Instructions to Bidders, or as otherwise may be directed by Owner.

1.2 QUALITY ASSURANCE

A. The Landscape Contractor shall provide, on site, an experienced foreman who shall be present at all times during the execution of the work, and who shall be thoroughly familiar with the type of materials being installed and the proper materials and methods for their installation. The foreman may not be replaced without the written permission of the Owner and Landscape Architect.

1.3 SUBMITTALS

A. The Landscape Contractor shall submit to the Landscape Architect shop drawings and or samples as required by the Drawings.

1.4 JOB CONDITIONS

A. Services for Construction

1. Water will be available at the site and is furnished by the Owner at no cost to the Contractor. The Contractor will furnish water transportation.

2. The Contractor's attention is directed to the fact that there are active utilities located within the limits of work. Before commencing work, the Contractor shall familiarize himself with the layout and operation of all utility systems and shall protect them from damage, all of their parts above and below ground. Any damage resulting from the Contractor's operations shall be immediately reported to the Owner and Landscape Architect. The Contractor shall be responsible for the cost of all repairs to utilities damaged by the Contractor.

B. The Contractor shall exercise care to protect existing work, buildings, trees, shrubs, lawns, etc. form any and all damage. Damage caused by the execution of the work by the Contractor shall be repaired to the satisfaction of the Owner at the expense of the contractor.

C. It shall be the Contractor's responsibility to conduct his activities in a clean, neat manner throughout the contract period. Sidewalks, streets, and other paved areas shall be continuously kept clean when planting and maintenance operations are in progress, and the entire work area shall be cleaned at the end of each day's work.

D. The Landscape Contractor shall assume sole responsibility for, and shall hold harmless from

any loss, cost, damage, or liability sustained by the Owner as a result of negligence and/or omissions by the Landscape Contractor and all associated subcontractors.

1.5 GRADING & BACKFILLING

A. Fill Materials: The Owner will be responsible for achieving approximate finish grade. The Contractor shall be responsible for fine grading (top 4") and preparation for planting. Minor filling required to facilitate drainage shall be the responsibility of the Contractor. Fill material required shall be topsoil, typical of the region, which shall be friable, natural topsoil, reasonably free of roots, rocks, weeds, and foreign matter. It shall not be handled in a muddy or frozen condition. Every effort shall be made to preserve organic matter.

B. Unsatisfactory Materials: If any of the topsoil brought in is determined by the Landscape Architect and or Owner to be unsuitable for planting use, the material shall be removed and replaced as directed by the Landscape Architect and or Owner.

C. Raking and Smoothing: The Contractor shall rake and smooth topsoil by machine or hand methods. Surfaces hall be first smoothed with a tractor, then the entire surface shall be raked clean of roots, rocks, and debris - providing a smooth surface which shall assure surface drainage away from buildings, walks, and curbs to drainage structures, and then smoothed with a machine or hand drawn screen (depending on the size of the area to be prepared). Screen dragging of all lawn areas is required, not optional -- no exceptions. All grading shall be approved by Landscape Architect prior to planting and or grassing.

PART 2 – PRODUCTS

2.1 PLANTING MATERIALS

A. Planting Soil: Any variation from this specification shall be fully described in writing by the Contractor and a sample approved on-site by the Landscape Architect.

1. Topsoil shall be fertile, friable, natural topsoil, brown in color and reasonably free of weeds and foreign matter. It shall not be handled in a muddy or frozen condition. Every effort shall be made to preserve organic matter.

2. Organic matter shall be peat humus (FS Q-P-166) and with texture and pH range suitable for intended use. Above components shall be mixed as follows: 1/3 Topsoil, 1/3 Organic Matter, and 1/3 Existing Soil (if suitable). The components shall be thoroughly mixed to a uniform consistency by hand or machine methods. Note: If existing backfill is deemed unsuitable, the planting soil mix shall consist of 50% topsoil and 50% organic matter.

B. Plants

1. General: All plant materials shall conform to or surpass minimum quality standards as defined by the American Association of Nurserymen, current edition of American Standards for Nursery Stock, 635-636 Southern Building, Washington, D.C. In all instances specifications outlined in the plant materials schedule take precedent.

2. Certificates of Inspection for Plant Materials: All necessary inspection certificates shall be supplied to the Landscape Architect for each shipment of plant material, as required by law. Certificates showing source of origin shall be filed with the Landscape Architect prior to acceptance of material.

3. Inspection: All plant material shall be subject to inspection and approval. The Landscape Architect reserves the right to reject any and all plant material which fail to meet this specification and or requirements indicated on the Drawings. The Contractor shall remove all rejected plant material from the site within seven days of notification.

4. All plant material furnished shall be nursery grown, freshly dug, of normal habit, well branched, proportioned width to height, healthy and vigorous in growth, and shall have a well-developed root system. All plants shall be true to species and variety. Plants used where symmetry is required shall match as nearly as possible.

5. Height and spread dimensions refer to the main body of the plant and not from branch tip to branch tip. The minimum acceptable sizes for plants measured before pruning with branches in normal position shall conform to measurements specified. Stock furnished in a size range specified shall mean not less than fifty percent and shall be of the maximum size specified within each range. Plants larger than specified may be used with the approval of the Landscape Architect at no additional cost to the Owner.

6. All plants shall be of healthy stock - free from diseases, insects, eggs, larvae, and parasites of an objectionable nature.

7. Availability and Substitutions: Substitutions for the plants specified will be accepted only when satisfactory evidence is submitted (in writing) to the Landscape Architect, showing that the plant material is not available. Requests for approval of substitutions of at least equivalent size and having essential characteristics similar to the originally specified material will be considered for approval.

C. Materials for Guying and Staking

1. Stakes for supporting trees under two inch (2") caliper or multi-stem plants, shall be of sound timber, straight, uniform, sized as shown in the details, and of sufficient length to adequately support the plant. All stakes are to be painted dark gray.

2. Stakes for anchoring guy wires in the ground shall be #3 re-bars as shown in the planting details and shall be of sufficient length to hold guy taut and maintain tree firmly in upright position.

3. Wire shall be #12 gauge galvanized wire in double twisted strands.

4. Hose shall be suitable lengths of new or used reinforced black rubber or plastic garden hose with a maximum diameter of one-half inch (1/2").

D. Additional Materials

1. Mulch shall be clean, fresh, free of branches, cones, and foreign material, delivered to the site in bales or bulk and shall be long leaf pine straw.

2. Fertilizer shall be Sta-Green Nursery Special, or equal, delivered to the site in unopened containers.

3. Burlap for wrapping earth ball shall be made of jute and weigh not less than 7.2 ounces per square yard.

2.2 LAWN MATERIALS

A. Sod shall be 'Rebel' Tall Fescue. Areas to be sodded are as indicated on the Drawings. Sod shall be freshly cut and not less than 2" in thickness and shall be free of weeds, pests, and disease. Sod shall be certified. Sod shall be of uniform size and shape. Sod shall be installed not more than 72 hours after cutting. If sod is not installed within 48 hours of cutting, it is to be unstacked, unrolled, placed in shade, and kept moist (not wet) until installed.

B. Fertilizer: Fertilizer shall be Sta-Green Seed & Sod Fertilizer (18-24-10) or equal. It shall be uniform in composition, dry, free flowing, and shall be delivered to the site in the original, unopened containers each bearing the manufacturer's guaranteed analysis. Fertilizer shall not have been exposed to weather prior to delivery to the site, after delivery and shall be completely protected at all times until used. Fertilizer shall not be stored in direct contact with the ground.

C. Dolomitic lime shall be ground agricultural limestone, free of impurities, delivered to the site either bagged or in bulk and protected from weather. It shall not be stored in direct contact with the ground.

D. Topsoil: Topsoil shall be as defined in Part 2.1 of these Specifications.

E. Wood fiber mulch used in hydroseeding applications shall be virgin wood fiber mulch such as 'Conwed' or approved equal. On slopes 2:1 or greater the virgin wood fiber shall be imbedded with tackifiers such as 'Conwed 2000' or approved equal.

F. Wheat Straw (for mulch areas seeded by hand) shall be fresh and shall be free of weed seed.

PART 3 EXECUTION

3.1 PLANTING OPERATIONS

A. Preparation, Handling, and Digging

1. Retain as by many fibrous roots as possible. Plants designated B&B shall be adequately balled with firm natural balls of soils in sizes as specified in American Standards for Nursery Stock. Balls shall be wrapped firmly in burlap and securely tied with heavy twine or rope.

2. Handle plants so that root systems and branches are adequately protected at all times from drying out. Plants that cannot be planted immediately on delivery shall be kept in the shade, well protected with soil, wet moss, or other acceptable material, and shall be kept well watered. Plants shall not remain unplanted for longer than three (3) days after delivery.
3. Prepare plants for shipment in a manner that will prevent any damage to the branches, shape, or future development of the plant.

4. Do not remove container-grown stock from their containers until planting time.

5. At least one plant of each species and variety specified shall have a securely attached

waterproof tag bearing legible designation of botanical name and source.

B. Layout of Major Plantings: The Contractor shall stake out all the trees, shrubs, and ground cover beds indicated in the Drawings, for approval by the Landscape Architect, prior to the installation of plant material. The Contractor as directed by the Landscape Architect at the expense of the Contractor will relocate plant material installed without approval.

C. Planting Operations and Conditions: All plants, deciduous and evergreen, shall be planted at such times of the year as the job may require, with the agreement of the Contractor to guarantee the material as herein specified. Actual planting shall be performed only during periods when weather conditions are suitable.

D. Excavation for Planting Trees and Shrubs

1. Circular plant pits with vertical sides shall be dug by machine or hand methods as shown on the Drawings for planting trees and shrubs. Plant pit diameters shall be a minimum two (2) times greater than that of the spread of the root mass.

2. All tree pits must be loosened to a depth of two feet (2') below the bottom of the pit or to such a depth that any hardpan has been broken up and moisture is allowed to move through freely. The Contractor shall fill each pit with water and observe the pit for a period of twelve (12) hours. If the water has not dissipated by fifty per cent (50%), the pit shall be drilled with a twelve inch (12") auger to a depth of four feet (4') below the bottom of the pit and filled with gravel. If in the opinion of the Contractor the drainage is still insufficient, the Contractor shall notify the Landscape Architect in writing prior to installing the plant material. Otherwise, the Contractor is deemed to be totally responsible for the guarantee and livability of the plant material.

E. Excavation for Planting Groundcover and Color Beds

1. Groundcover beds shall be scarified by hand or machine methods to a depth of twelve inches (12"). Two inches (2") of organic matter and twenty (20) pounds per one thousand (1,000) square feet of Sta-Green Nursery Special Fertilizer (or equal) shall be incorporated into the soil.

2. Daylily beds shall be scarified by hand or machine methods to a depth of twelve inches (12"). Two inches (2") of organic matter and four (4) pounds per one hundred (100) square feet of 0-20-20 fertilizer shall be incorporated into the soil.

3. Under existing tree canopy scarification and preparation of groundcover and seasonal color beds shall be by hand methods only with extreme care being exercised to avoid damage to the existing tree roots.

4. Seasonal color beds shall be excavated to a depth of eighteen inches (18") below finished grade. Backfill with 50% topsoil and 50% organic matter and fertilizer (5-10-10, at the rate of 1/2 cup per square yard) shall be thoroughly worked into the planting soil mix.

F. Setting Trees and Shrubs

1. All plants shall be set so that when settled they will occur approximately two to three inches (2"-3") above finish grade, (allow an additional two to three inches (2"-3") to compensate for settling). Each plant shall be planted neatly in the center of the pit.

2. Set plants plumb and brace rigidly in position until the planting soil has been tamped solidly around the ball and roots.

3. Balled and container plants shall be placed firmly upon scarified subgrade and backfilled with the planting soil mixture. Remove non-deteriorating binder from root ball. Hand tamp carefully around and under ball to fill all voids. Water during backfilling. Form saucer from planting soil mix in order to retain water.

4. Repair any disturbed areas as necessary to return them to their original state.

G. Guying, Staking, Wrapping, and Mulching

1. Staking shall be completed immediately after planting. Plant shall be plumb after staking in accordance with the appropriate detail.

2. Guy trees over two inches (2") caliper. Space three (3) guys equally about each tree, attached at approximately two-fifths (2/5) of the trunk height and at a forty-five (45) degree angle and anchored in ground with deadmen. Guy to trunks with wire loops and rubber hose drawn taut in all directions. Guys shall be equally taut.

3. Stake trees less than two inches (2") in caliper with two (2) wooden stakes driven approximately one-half (1/2) of trunk height. Stake to be one foot (1') from trunk, fastened at approximately two-fifths (2/5) of trunk height with wire run through black rubber hose. Do not drive stakes through rootball.

4. Mulch all planting beds and other areas as designated with three inches (3") of fresh mulch. Individual plants are to be mulched as detailed on the Drawings.

H. Maintenance of Planted Areas

1. Maintenance shall begin immediately after each plant is planted and shall be provided until the work is accepted by the Landscape Architect and Owner upon completion of all work under the Contract.

2. Maintenance of new plantings shall consist of pruning, watering, cultivating, weeding, mulching, tightening and repairing guys, re-setting plants to proper grades or upright position, restoration of earth berm saucer, and furnishing, supplying, and applying such sprays as necessary to keep plantings free of insects and disease. If planting is performed after lawn areas have been prepared or installed, proper protection to these areas shall be provided, and any all damage resulting from planting operations shall be promptly repaired.

3. Planting areas and plants shall be protected at all times against trespassing and damage

of any kind for the duration of the maintenance period. If any plants become damaged or injured, they shall be treated or replaced as directed by the Landscape Architect at no additional cost to the Owner.

4. The root system of all plants shall be watered at such intervals as will keep the surrounding soil in the best condition for promotion of root growth and plant life.

5. All planting and plant materials required by this Contract shall be in a satisfactory and acceptable condition when the Contractor requests payment.

3.2 GRASSING OPERATIONS

A. Soil Preparation

1. Owner's previous distribution of topsoil shall have achieved approximate finished grade.

2. Prepare a good crumbly sod bed that is tilled six to eight inches (6"-8") deep, well firmed after tilling, and well leveled. Grade to achieve proper surface drainage. Fine grade all lawn areas to finish grade. Where no grades are indicated, areas shall have a smooth and continual grade between fixed controls such as walks, curbs, etc. and elevations shown. Rake level as necessary to obtain true, even lawn surfaces, entire area to be dragged with a screen for final smoothing prior to sodding. All finish grades shall meet the approval of the Landscape Architect prior to sodding.

3. Approximately two (2) days prior to sodding, apply lime at a rate necessary to provide a neutral pH over the area to be seeded. Work lime into the top four to six inches (4"-6") of topsoil. Application of lime required if indicated by a soil test. Contractor to obtain soil test and deliver a copy to the Landscape Architect prior to seeding operations.

4. Broadcast fertilizer uniformly at a rate determined by soil (s) test over newly prepared soil and work into top three-quarter inch (3/4") inch of topsoil. Rate of fertilizer application to be as per the soil test.

5. After all materials have been worked in, firm up the soil by rolling to assure that no soft spots remain that will settle in the future.

B. Sodding Operations

1. After preparing soil as outlined in Section 3.2.A. above, rake the surface of areas to be sodded with a wide toothed rake or tine harrow into a crumbly state with about 1" loose soil at the surface.

2. Do not lay sod on hot, dry, powdery soil. Irrigate if necessary prior to laying sod. A soil that is moist to a depth of six inches (6”), but not saturated, allows the new roots to establish rapidly.

3. Lay sod perpendicular to the direction of the slope and in a manner that will permit the joints to stagger. Fit pieces together so that the edges are in good contact with each other, but not overlapping and so that no joint is visible. Use topsoil to fill any open joints. On sloped areas, peg the sod as necessary with wooden pegs to prevent slippage.

4. After sodding operations are complete, and approved by the Landscape Architect and Owner, roll sod with a three hundred (300) pound roller to insure good contact with the

soil.

5. Water newly sodded areas two to three times daily as weather conditions indicate until the lawn is well established (approximately 30 calendar days).

3.3 LAWN MAINTENANCE AND REPAIR

A. Maintenance of all lawn areas shall consist of watering, weeding, cutting, repair of any erosion, and re-sodding as necessary to establish a uniform stand of the specified grass, and shall continue until the Landscape Architect and Owner have accepted the work.

B. All lawn areas shall be protected until accepted (at least through the first mowing). All eroded and damaged areas, regardless of cause, shall be immediately repaired and re-sodded. Protect all lawn areas from traffic.

C. When lawns have become established as required above, a final inspection of the lawn work will be made upon completion of the total job. If the work is found to be satisfactory and in accordance with all requirements of the Drawings and Specifications, the work will be accepted.

3.4 CLEAN UP

A. The Contractor shall protect the property of the Owner and the work of other contractors. The Contractor shall also be directly responsible for all damage caused by his activities and for the daily removal of all trash and debris from his work area to the satisfaction of the Landscape Architect and the Owner. The Contractor is responsible for washing all drives, parking lots, curbs, sidewalks, etc. to remove mulch, debris, mud, etc.

3.5 FINAL INSPECTION FOR ACCEPTANCE AT COMPLETION

A. Prior to request for final inspection Contractor shall have completed 100% of work covered by Contract. All plant materials shall be alive and in a vigorous condition at the time request for inspection is made - replacement plants and lawn repair are not warranty items until all items are accepted in full (date of final acceptance) by Landscape Architect and Owner.

B. A final inspection for acceptance will be made by the Landscape Architect within seven (7) days of notification from the Contractor that in his opinion the work is 100% complete. If the Landscape Architect determines that the work is complete and acceptable, written notification of the date of acceptance will be sent to the Contractor. If the Landscape Architect determines the work is not complete Contractor shall have seven days to complete work. If work remains incomplete upon second inspection by Landscape Architect, Contractor shall be responsible for all extra costs incurred by Owner for subsequent inspections.

C. The Contractor shall furnish the Owner with a written maintenance schedule for weeding, pruning, fertilizing, watering, etc., in order to insure the Owner of the continued success of the planting. This schedule shall include sufficient instructions for each item so that the Owner will have a clear maintenance concept. The work will not be considered complete until Owner has received the written maintenance instructions.

D. Upon written notification of acceptance the Contractor's responsibility for maintenance is ended, and adequate maintenance becomes the sole responsibility of the Owner.

3.6 GUARANTEE, INSPECTION, AND REPLACEMENT

A. The Contractor's guarantee period begins the on date of final acceptance by the Landscape Architect and the Owner as stated in the written notification of acceptance.

B. Guarantee Period: All plant materials, lawn areas, and construction covered by the Contract shall be guaranteed by the Contractor for a period of one (1) year from the date of final acceptance.

C. During the entire Guarantee Period the Contractor shall make periodic inspections of the project to satisfy himself that maintenance by the Owner is adequate. These inspections shall be a minimum of one time per month. Any maintenance methods or products he deems not normal or detrimental to good plant growth shall be reported to the Owner in writing and a copy sent to the Landscape Architect. Failure to make inspections and issue written reports of deficiencies shall be interpreted to mean that the Contractor approves of the Owner's maintenance practices and Contractor shall be held responsible for fulfilling the terms of his guarantee and shall promptly make any and all necessary plant material replacements, including trees, shrubs, groundcovers, perennials, and lawns.

3.7 INSPECTION AT THE TERMINATION OF THE GUARANTEE PERIOD

A. At the end of the guarantee period inspection of the plant material will be made by the Landscape Architect upon written notice requesting such inspection submitted by the Contractor at least ten (10) calendar days prior to the termination date of the Guarantee Period. The guarantee period does not end until Contractor contacts Landscape Architect/Owner for this inspection.

B. The Contractor shall replace, without cost to the Owner and as soon as weather conditions permit, all dead plants and all plants not in vigorous thriving condition, as determined by the Landscape Architect at the end of one (1) year Guarantee Period. Replacements shall closely match adjacent specimens of the same species, and shall be subject to the selection in the field by the Landscape Architect/Owner prior to digging. Replacements shall be subject to requirements stated in these Specifications and on the Drawings.

C. Replacement material shall be guaranteed for a period of one (1) year from the date of replacement. Should replacement be made while plant is normally dormant the guarantee of said material shall extend thirty calendar days after plant comes into full leaf (i.e., January replacements would be guaranteed for one year plus 2-3 months).

D. The Contractor shall make all necessary repairs to grades, lawn areas, and paving required because of plant replacements. Such repairs shall be done at no cost to the Owner.

END OF SECTION 02 900

SECTION 02 930 - LAWNS & GRASSES

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This section covers soil preparation and planting of grass on all disturbed site areas outside building and pavement construction areas.

B. Related Requirements: Section 02 950 MAINTENANCE.

PART 2 - PRODUCTS

2.01 SOIL AND ADDITIVES:

A. Topsoil:

1. Existing topsoil specified in Section 02110 must be acceptable to grassing contractor.

2. Topsoil not redistributed for grass under this contract shall be left stockpiled for use in future grassing.

B. Lime: Agricultural ground limestone containing 85% carbonates.

C. Fertilizer: Commercial mixed grade containing 5-10% nitrogen, 10-15% phosphorus and 10-15% potassium.

2.02 SEED:

A. Select grass appropriate to planting season and site conditions from "Seeding Table" of Section 700 - Grassing/Georgia D.O.T. Standard Specifications - 1983 Edition.

B. Furnish seed meeting requirements of the Georgia Seed Laws and Rules and Regulations.

2.03 MULCH:

Compressed and bound bales of local hay straw.

PART 3 - EXECUTION

3.01 SOIL PREPARATION:

A. Loosen subsoil to depth of 4" over area to receive grass and remove large clods, roots and debris.

B. Spread topsoil in minimum 4" deep layer over the area to receive permanent grass. Fill depressions, remove clods over 2" diameter, weeds, roots or debris.

C. Uniformly spread 50 lbs. of lime and 35 lbs. of fertilizer per 1000 square feet with mechanical spreader and mix topsoil, lime and fertilizer to depth of 4" with rototiller run in 2 passes at right angles.

D. Level and smooth prepared topsoil to finish grade and contour.

3.02 SEEDING:

A. Sow seed uniformly with mechanical spreader at rate shown on plans. Hand distribution will not be permitted.

B. Roll with cultipacker to cover seed. Lightly compact surface soil. Water with fine spray.

Note: Contractor may vary method of seeding on his own responsibility to provide uniform grassed area.

3.03 MULCHING:

A. Uniformly spread mulch by hand or mechanical methods at rate of 1-1/2 tons per acre (3/4" to 1-1/2" deep) immediately after seeding.

B. Replace any mulch blown away. Secure mulch to ground to maintain ground cover.

3.04 PLANT ESTABLISHMENT:

A. Maintain grassed areas by watering, mowing, repairing erosion wash outs and applying additional seed, fertilizer or mulch as required to establish a satisfactory stand of grass.

B. Satisfactory stand of grass is living grass cover over distributed areas, with no single bare spots larger than one square foot.

3.05 RESTORATION AND CLEAN-UP:

A. Restore existing grassed area damaged during planting operations, to original condition.

B. Clean paved areas, soiled or stained during planting operations to original condition by sweeping, washing and removing stains.

C. Remove all materials, containers and debris.

END OF SECTION 02 930

SECTION 02 950 - MAINTENANCE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Grounds Maintenance shall be inclusive of the complete care and guarantee of all planted trees, shrubs, groundcovers, lawn areas, and pinestraw mulched areas. Grounds Maintenance shall insure the Owner of a complete maintenance program for all designated tree, plant, lawn, and pinestraw mulched areas such that the quality shall not deteriorate but shall sustain vitality and new, healthy growth.

B. The limit of work shall cover all areas shown in the Drawings to receive plant material.

C. This specification section refers to Bid Alternate No. 2, see Section 01 030.

D. Maintenance Agreement Period: One Calendar Year.

1.02 QUALITY ASSURANCE

A. The Owner and Architect will make periodic reviews of the entire site related to the Contractor's performance. The Contractor will, on the sole judgment of the Owner and Architect, make repairs and adjustments as directed during said review.

B. Appropriate dress shall be worn, including shirts, by all maintenance personnel on site.

1.03 PESTICIDES, HERBICIDES, AND INSECTICIDES

A. The Contractor shall possess or shall hire a sub-tier Contractor who shall possess and maintain a valid pesticide applicator's license. All chemicals shall be used in strict accordance with manufacturer's most recent printed instructions and shall strictly comply with all federal, state, and local directives on environmental control, and carry an EPA approval number. A copy of the Contractor's valid Georgia pesticide applicator's license shall be filed with the Owner and Architect.

B. During times when pesticides, herbicides, insecticides or other chemicals dangerous to people or animals are in use Contractor shall post a warning sign prominently at all entrances to the areas where such chemicals are in use.

1.04 IRRIGATION SYSTEM

A. An automatic irrigation system and quick couplers have been provided in most of the landscaped areas for the Contractor's convenience. The Contractor is responsible for annual start-up and annual winterization of the irrigation system during his operations on site. Additionally, the Contractor is responsible for periodic inspection and adjustment of the irrigation system. Inspection will include physically observing the operation of every zone and noting malfunctioning and broken equipment. Broken equipment shall be immediately repaired. Contractor responsible for periodically making minor adjustments to sprinkler heads, valves, and scheduling of automatic controllers.

B. Automatic irrigation system is primarily for watering of lawn areas. Contractor is responsible for checking all planted trees, shrubs, groundcovers and annuals on site, especially in periods of abnormal rainfall, and providing supplemental watering if necessary.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. All products shall be as specified on the Drawings and in Section 02 900 of these Specifications. For products not specified the Contractor shall submit manufacturer's data sheets to the Architect for approval.

PART 3 - EXECUTION

3.01 LAWNS

A. Contractor shall use rotary type mowers designed for commercial use, and using small mowers for difficult or tight areas where commercial mowers cannot maneuver. Do not cut lawn areas with a nylon filament trimmer (i.e., weed eater). Contractor shall make every effort to mow an entire area during one mowing operation. Contractor shall mow all lawn areas once every seven days during the growing season and as needed during remainder of the year. Contractor shall mow fescue lawn areas to a uniform height of 2.5 to 3 inches.

Contractor is encouraged to use a pinestraw mulching type mower. If a pinestraw mulching mower is not used excessive clippings remaining on freshly mowed lawns shall not be permitted. Contractor shall rake or otherwise remove all grass clippings. All clippings shall be disposed of lawfully off-site by the Contractor unless otherwise directed.

B. Edging: Neatly edge and trim around all plants beds, curbs, walks, streets, trees, light poles, buildings, walls, etc. Use mechanical edgers and "weed-eaters" with a nylon filament for edging. Maintain all shapes and configurations of plant beds as per the original design intent. Care shall be taken not to injure tree trunks or plant material. Edging shall be performed every other week during the growing season and as needed during the remainder of the year.

One time per month inspect metal edging (where lawn areas are adjacent to decomposed granite paving) and repair as require as per the edging manufacturer's most recent printed instructions.

C. Paved Surfaces: Sweep or power "blow" all curbs, walks, streets, etc. after mowing operations are complete each week. If using an air blower special care shall be taken to insure debris is not blown into streets or onto adjacent property, and that sand, small pebbles, and other debris is not blow directly at any automobile. Do not blow clippings and other debris from paved surfaces into lawn and pinestraw mulched areas. Paved, pinestraw mulched, and lawn areas shall have a neat, clean appearance after "blowing" operations are complete. Blow debris into piles and remove from site and dispose of lawfully.

D. Fertilizing: Fertilize the entire lawn area three (2) times per year with a mechanical spreader using a granulated grade of fertilizer 10 pounds per 1000 square feet (12-4-8) with at least 50% of its nitrogen in slow release form in early spring, 10 pounds in early August. If lawn shows signs of iron chlorosis (yellow leaves) apply ferrous sulfate at the rate of one tablespoon per three gallons of water per 1000 square feet.

F. Weed Control: The Contractor shall employ mechanical or chemical measures to help control and eliminate weeds or undesirable grasses in lawn areas. Contractor shall once per year apply a pre-emergent to all lawn areas within the limits of this Contract. Apply in late winter or early spring, before the ground warms enough to stimulate root growth of obnoxious weed seed. Apply as per the Manufacturer's most recent printed instructions.

3.02 SHRUBS

A. Abnormal Conditions: Two times per month check all shrubs for abnormal conditions (i.e., insects, borers, web worms, red spiders, poor color, fungi, etc.) and report findings to Architect along with proposed treatment solution and immediately.

B. Pinestraw mulch: Maintain a good heavy pinestraw mulch (3" minimum depth) around all shrubs. Pinestraw mulch around and in-between shrubs and in shrub beds are to be kept free of weeds, grass, trash and debris at all times. Fresh pinestraw mulch shall be reapplied two times per year. When pinestraw mulching shrubs and shrub beds carefully pinestraw mulch around and in between plants -- do not cover shrubs with pinestraw mulch. Under no circumstances apply fresh pinestraw mulch over weeds which have not been previously treated with an appropriate herbicide.

C. Pruning: Prune shrubs as directed by the Architect two times per month during the growing season and as needed throughout the rest of the year. Pruning shall maintain an attractive shape and fullness with respect to the intended character of the shrub planting.

D. Fertilizing: Fertilize all shrubs two times per year (early spring and late summer) with a 6-12-12, 50% organic fertilizer by spreading around the base of each shrub and working the fertilizer into the soil by hand. Use 1/2 cup of fertilizer per foot of shrub height.

E. Edging: All shrub beds shall be trench-edged as per the detail prior to the annual application of pinestraw mulch. Trench edge shall be 2"-3" deep and shall be for the purpose of defining the shape of the shrub bed and to provide a restraint for rolling and tucking the pinestraw mulch for a neat, crisp appearance.

F. Weed Control: All shrub beds are to maintained such that their appearance is weed free. Contractor shall spray for weed control two times per month and shall, when necessary, pull weeds to maintain this weed free appearance. Large weeds shall be pulled by hand (including large weeds which are dead) and disposed of off-site lawfully.

3.03 GROUNDCOVERS

A. Abnormal Conditions: Two times per month check all groundcovers for abnormal conditions (i.e., insects, borers, web worms, red spiders, poor color, fungi, etc.) and report findings to Architect along with proposed treatment solution and immediately.

B. Pinestraw mulch: Maintain a good heavy pinestraw mulch (3" minimum depth) around all groundcovers. Pinestraw mulch around and in between plants in groundcover beds are to be kept free of weeds, grass, and debris at all times. Fresh pinestraw mulch shall be reapplied two times per year. When pinestraw mulching groundcover beds carefully pinestraw mulch around and in between plants -- do not cover plants with pinestraw mulch. Under no circumstances apply fresh pinestraw mulch over weeds which have not been previously treated with an appropriate herbicide.

C. Pruning: Prune and or cut back groundcovers as directed by Architect. Most groundcovers will require only annual pruning or occasional thinning to adequately maintain the desired shape and fullness with respect to the intended character of the planting. Climbing groundcovers, such as english ivy, shall be kept from climbing on trees and structures unless otherwise directed by Architect.

D. Fertilizing: Fertilize all groundcovers one time per year in the early spring with a complete all purpose fertilizer. Apply at the rate of three pounds per 100 square feet.

E. Edging: All groundcover beds shall be trench-edged as per the detail prior to the annual application of pinestraw mulch. Trench edge shall be 2"-3" deep and shall be for the purpose of defining the shape of the groundcover bed and to provide a restraint for rolling and tucking the pinestraw mulch for a neat, crisp appearance.

F. Weed Control: All groundcover beds are to maintained such that their appearance is weed free. Contractor shall spray for weed control two times per month and shall, when necessary, pull weeds to maintain this weed free appearance. Large weeds shall be pulled by hand (including large weeds which are dead) and disposed of off-site lawfully.

3.04 TREES

A. Abnormal Conditions: Two times per month check all trees for abnormal conditions (i.e., insects, borers, web worms, red spiders, poor color, fungi, etc.) and report findings to Architect along with proposed treatment solution and immediately.

C. Pinestraw mulch: Maintain a good heavy pinestraw mulch (3" minimum depth) around all trees. The top of the "tree pit and saucer" is to be maintained weed free. Fresh pinestraw mulch shall be reapplied two times per year. In areas where trees have been planted in decomposed granite, periodically top dress decomposed granite (with material as originally specified) as required to top of metal edge defining plant pit.

D. Edging: One time per month inspect metal edging and repair as required as per edging manufacturer's most recent printed instructions.

C. Pruning: Prune or thin trees as directed by the Architect two times per year (minimum-once before spring and once mid-summer) to adequately maintain an attractive shape and fullness with respect to the intended character of the planting. Additionally, remove all sucker growth and all dead wood and paint or care for all cuts, wounds, and or scars as necessary in accordance with International Society of Arborculture practices. Pruning is required on all trees to a height of 15'.

D. Fertilizing: All planted trees are to be deep root fed each spring with 9-12-12 fertilizer. Feed by boring a 1-1/2 " diameter hole into the ground to a depth of 15"-18" (8-10 holes per tree - space holes evenly). Use one cup of fertilizer per caliper inch per tree (evenly distribute fertilizer between all holes). Measure caliper six inches above ground. Each hole is to be covered with soil after fertilizing.

E. Watering: Unless irrigated, Contractor shall fill each "Gator Bag" or equal with water two times per week from May 15 through November 1. The Contractor shall inspect all "Gator Bags" one time per month to verify that each bag is in good condition and has not acquired any tears or that any of the weep holes have become clogged. Repair and or replace "Gator Bags" as required.

3.05 ANNUAL BEDS

A. Abnormal Conditions: Two times per month check all annuals for abnormal conditions (i.e., insects, borers, web worms, red spiders, fungi, poor color, etc.) and report findings to Architect along with proposed treatment solution and immediately.

3.06 PINESTRAW MULCH AND MISCELLANEOUS ITEMS

A. All pinestraw mulched beds to be trench edged prior to application of fresh pinestraw mulch. Trench edge to provide a neat, crisp, well defined shape to beds and shall provide an edge to roll and tuck pinestraw mulch against. Clods of earth generated during trenching operations to be well broken up and evenly distributed in bed prior to applying fresh pinestraw mulch. Pinestraw mulch to be as originally specified herein in Section 02 900.

B. For all pinestraw mulched areas not addressed elsewhere in these Specifications, pinestraw mulch to be applied to a 3-inch depth. Pinestraw mulched areas to be maintained reasonably weed free and under no circumstance shall fresh pinestraw mulch be applied over weeds that have not previously been cut back and treated with an appropriate herbicide.

C. Leaf Removal: All leaves from existing trees to be raked and removed from the site by the Contractor. Leaves are to be removed as they drop during the fall.

End of Section 02 950

SECTION 03 300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

B. Related Sections include the following:
   1. Section 02 200 for drainage fill under slabs-on-grade.
   2. Section 02 520 for concrete pavement and walks.

1.03 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mix water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
   1. Cementitious materials and aggregates.
   2. Form materials and form-release agents.
   3. Steel reinforcement and reinforcement accessories.
   4. Admixtures.
   5. Waterstops.
   6. Curing materials.
   7. Floor and slab treatments.
   8. Bonding agents.
   9. Adhesives.
   10. Vapor retarders.
   11. Epoxy joint filler.
   12. Joint-filler strips.
   13. Repair materials.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94/ ASTM C 94M requirements for production facilities and equipment.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

F. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
   1. ACI 301, "Specification for Structural Concrete."
   2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.01 FORMS AND FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.
   2. Plywood shall comply with U.S. Product Standard PS-1 “B-B (Concrete Form) Plywood” Class 1, Exterior Grade or better.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Piers, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, ¾” by ¾”, minimum.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

   1. Furnish ties that, when removed, will leave holes not larger than 1" in diameter in concrete surface.

2.02 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615M, Grade 400, deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Plain-Steel Wire: ASTM A 82, as drawn.

D. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

2.03 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
   1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.

B. Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 400. Cut bars true to length with ends square and free of burrs.

2.04 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I.

B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:

   1. Class: Moderate weathering region, but not less than 3M.
   2. Nominal Maximum Aggregate Size: 1".

C. Water: Potable and complying with ASTM C 94.

2.05 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.06 WATERSTOPS

A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory-fabricate corners, intersections, and directional changes.
   1. Profile: To suit joint.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. PVC Waterstops:

      a. Greenstreak.
      b. Meadows: W. R. Meadows, Inc.
      c. Murphy: Paul Murphy Plastics Co.
      d. Progress Unlimited Inc.
      e. Sternson Group.
      f. Tamms Industries Co.; Div. of LaPorte Construction Chemicals North America, Inc.
      g. Vinylex Corporation.
      h. Westec Barrier Technologies; Div. of Western Textile Products, Inc.

C. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip, sodium bentonite or other hydrophylic material for adhesive bonding to concrete.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

      a. Volclay Waterstop-RX; Colloid Environmental Technologies Co.
      b. Conseal CS-231; Concrete Sealants Inc.
   c. Swellseal Joint; De Neef Construction Chemicals (U.S.) Inc.
   d. Hydrotite; Greenstreak.
   e. Mirastop; Mirafi Moisture Protection, Div. of Royal Ten Cate (USA), Inc.
   f. Adeka Ultra Seal; Mitsubishi International Corporation.
   g. Superstop; Progress Unlimited Inc.

2.07 VAPOR RETARDERS

A. Vapor Retarder: ASTM E 1745, Class C, of one of the following materials; or polyethylene sheet, ASTM D 4397, 8 mil thick:
   1. Nonwoven, polyester-reinforced, polyethylene coated sheet; 8 mil thick.

2.08 FLOOR AND SLAB TREATMENTS

A. Penetrating Liquid Floor Treatment: Chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Penetrating Liquid Floor Treatment:

a. Titan Hard; Burke Group, LLC (The).
b. Chemisil Plus; ChemMasters.
c. Intraseal; Conspec Marketing & Manufacturing Co., Inc.
d. Ashford Formula; Curecrete Chemical Co., Inc.
e. Day-Chem Sure Hard; Dayton Superior Corporation.
f. Euco Diamond Hard; Euclid Chemical Co.
g. Seal Hard; L&M Construction Chemicals, Inc.
h. Vexcon Starseal PS; Vexcon Chemicals, Inc.
i. Sealtight; W. R. Meadows of Georgia

2.09 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz/sq. yd.dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

F. Available Products: Products that may be incorporated into the Work include, but are not limited to, the following:

a. Klear-Kote Cure-Sealer-Hardener, 30 percent solids; Burke Group, LLC (The).
b. Polyseal WB; ChemMasters.
c. UV Safe Seal; Lambert Corporation.
d. Lumiseal WB Plus; L&M Construction Chemicals, Inc.
e. Vocomp-30; W. R. Meadows, Inc.
f. Metcure 30; Metalcrete Industries.
g. Vexcon Starseal 1315; Vexcon Chemicals, Inc.

2.010 RELATED MATERIALS

A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Joint-Filler Strips: ASTM D 1752, cork or self-expanding cork.

C. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

D. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.

E. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

F. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements.

G. Reglets: Fabricate reglets of not less than 0.55-mm-thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

H. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.85 mm thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.011 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8" and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8" to ¼" or coarse sand as recommended by underlayment manufacturer.

2.012 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
   1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
   2. Proportion lightweight structural concrete according to ACI 211.2 and ACI 301.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Footings:
   1. Maximum Slump: 4".

D. Slab-on-Grade:
   1. Maximum Slump: 4".

E. Masonry Fill and Fill for Stair Treads and Landings:
   1. Maximum Slump: 5".

F. "Non-Structural" Concrete for Electrical Duct Bank:
   1. Maximum Slump: 6".

G. Maximum Water-Cementitious Materials Ratio: 0.50 for concrete required to have low water permeability.

H. Maximum Water-Cementitious Materials Ratio: 0.40 for concrete exposed to deicers or subject to freezing and thawing while moist.

I. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 4 to 6 percent, unless otherwise indicated.

J. Do not air entrain concrete to trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.

K. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

L. Admixtures: Use in strict compliance with manufacturer’s directions.

2.013 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.014 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

2.015 BONDING AGENT: Polyvinyl acetate or acrylic base.

A. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   1. Polyvinyl Acetate (Interior Only):

      a. Superior Concrete Bonder, Dayton Superior Corp.
      b. Euco Weld, Euclid Chemical Co.
      c. Weld-Crete, Larsen Products Corp.
      d. Everweld, L&M Construction Chemicals, Inc.
      e. Ready Bond, Symons Corp.

PART 3 - EXECUTION

3.01 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class C, ½".

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
1. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor bolts, accurately located, to elevations required.
   2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
   3. Install dovetail anchor slots in concrete structures as indicated.

3.03 REMOVING AND REUSING FORMS

A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 10 deg C for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.

B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:

   1. At least 70 percent of 28-day design compressive strength.
   2. Determine compressive strength of in-place concrete by testing representative field- or laboratory-cured test specimens according to ACI 301.

C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.04 SHORES AND RESHORES

A. Comply with ACI 318M, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.

3.05 VAPOR RETARDERS

A. Granular Fill: Place granular fill on prepared subgrade. Moisten and compact with mechanical equipment to elevation tolerances of plus 0” or minus ¾”.

B. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 and manufacturer's written instructions. Tape joints of laminated sheet vapor retarder. Lap joints of polyethylene sheet 12”.

3.06 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging at elevated slabs. Lap edges and ends of adjoining sheets at least two mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire. Concrete block supports are acceptable at foundation footings and slabs.

3.07 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.
   2. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs as indicated.
   3. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
   4. Use bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as grade beams, and other locations, as indicated.
   1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
   1. Use dowel sleeves or lubricate or asphalt-coat or wrap in polyethylene one-half of dowel length to prevent concrete bonding to one side of joint.

3.08 WATERSTOPS

A. Flexible Waterstops: Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's written instructions.

B. Self-expanding, Strip Waterstops: Follow manufacturer’s recommendations for location of waterstops in joints. Inspect waterstop placement immediately prior to pouring concrete and replace any damaged waterstop material.

3.09 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mix.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

D. Deposit concrete in forms in horizontal layers no deeper than 24"and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
   1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
   2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   2. Maintain reinforcement in position on chairs during concrete placement.
   3. Screed slab surfaces with a straightedge and strike off to correct elevations.
   4. Slope surfaces uniformly to drains where required.
   5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
   1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature,

provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.010 FINISHING FORMED SURFACES

A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 3 mm in height.
   1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
   2. Do not apply rubbed finish to smooth-formed finish.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.011 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes.
   1. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system
   2. For slab on grade, finish surfaces to the tolerance of 5 mm in 3m.

E. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either

thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.012 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide 3/8” pea gravel concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.013 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 1 kg/sq. m x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12” lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 300 mm, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.014 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions on slabs where indicated on the drawings.
    1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
    2. Do not apply to concrete that is less than seven days old.
    3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.015 JOINT FILLING (EPOXY JOINT FILLER)

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
    1. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid epoxy joint filler full depth in saw-cut joints and at least 50 mm deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.016 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when disapproved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 mesh sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than ½" any dimension in solid concrete but not less than 1" in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
   2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
   3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
   1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01" wide.
   2. After concrete has cured at least 14 days, correct high areas by grinding.
   3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
   4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
   5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of ¼" to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
   6. Repair defective areas, except random cracks by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least ¾" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
   7. Repair random cracks and single holes 1" or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and

loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.017 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd or fraction thereof of each concrete mix placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 4.4 deg C and below and when 27 deg C and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
6. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.

    a. Cast and field cure one set of four standard cylinder specimens for each composite sample. Field cure specimens in similar manner to the concrete that is represented.
7. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimen at 7 days and two at 28 days and one at 56 days.

    a. Test one field-cured specimens at 7 days and two at 28 days and one at 56 days.
    b. Tunnel-formed concrete: Test two field cured specimens prior to removal of forms; test one field cured specimen prior to placing tunnel forms for a successive pour; test one specimen at 28 days.
    c. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.

C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

D. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

E. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days (also 14 hours and 4 days for tunnel formed concrete), concrete mix proportions and materials, compressive breaking strength, and type of break for all tests.

F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

G. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

END OF SECTION 03 300

SECTION 04 080 - MASONRY ANCHORAGE AND REINFORCEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Related sections:
1. Section 04220: Concrete Masonry Units.

1.2 REFERENCES

A. Standards of the following as referenced:
1. American Concrete Institute (ACI).
2. ASTM.

B. Industry standards:
1. ACI 530-95: *Building Code Requirements for Masonry Structures.*
2. ACI 530.1-95: *Specifications for Masonry Structures*.

1.3 SUBMITTALS

A. Product data:
1. Complete list of products for use; indicate compliance with specified requirements.
2. Indicate manufacturer, product, and correlation to specified item if from other manufacturer than specified item.
3. Intent to use specified products does not relieve responsibility of submitting product line.

B. Samples: Each specified item, if requested by Design Builder.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers:
1. Products specified as standard of quality are manufactured by Dur-O-Wal, Inc.
2. Products of manufacturers listed below meeting indicated standards and specified manufacturer's product data characteristics, except as modified below, are acceptable for use, subject to compliance with ACI 530-95 and specified requirements. Follow more stringent requirements.
a. AA Wire Products Company.
b. Heckmann Building Products, Inc.
c. Hohmann & Barnard, Inc.
d. Masonry Reinforcing Corp. of America.
e. Southern Construction Products, Inc.

2.2 MANUFACTURED UNITS

A. Masonry joint reinforcement:
1. Fabricate using ASTM A82-95a cold drawn wire; 80,000 PSI tensile strength, 70,000 PSI yield point, min., 30% reduction of area.
2. Galvanize as follows, minimum for interior walls, both wall surfaces on interior: ASTM A641-92, Class 1 Mill Galvanizing.
3. Rods: Nine gauge deformed side rods with nine gauge cross rods.

4. Butt weld cross rods to side rods.
5. Product quality standard: Dur-O-Wal, Inc.; Ladur Type7 or Dur-O-Wal, Inc.; Truss with two longitudinal rods.
6. Reinforcement width: 2" less than total wall width.
7. Reinforcement lengths: 10'-0", typical.
8. Furnish prefabricated "L" and "T" units at intersecting walls; same design and finish as joint reinforcement.

B. Column or beam anchors, select from either product quality standard:
1. Product quality standard: Channel slots and anchors.
   a. Slots: Dur-O-Wal, Inc.; D/A 904; 16 gauge steel; ASTM A153-95, Class B-2, hot dip galvanize after fabrication; fasteners type recommended by manufacturer for substrate; corrosion resistant or AISI Type 300 Series stainless steel.
   b. Anchors: Dur-O-Wal, Inc.; D/A 918-921; 3/16" wire; ASTM A153-95, Class B-2, hot dip galvanize after fabrication, minimum; length to attach to substrate face and embed 2" minimum in brick bed joints.
2. Adjustable weld-on anchors and flexible ties:
   a. Type: Two piece anchor and tie.
   b. Anchor: Dur-O-Wal, Inc.; D/A 709; 1/4" dia., ASTM A82-95a steel; ASTM A153-95, Class B-2, hot dip galvanize after fabrication, minimum; for weld-on attachment to structural column, 9" long with 4" vertical adjustment.
   c. Triangular tie: Dur-O-Wal, Inc.; D/A 709; 3/16" dia., ASTM A82-95a steel; ASTM A153-95, Class B-2, hot dip galvanize after fabrication, minimum; sizes for conditions encountered.
3. Furnish code indicated lateral restraint while permitting horizontal and vertical movement in system.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install accessories in accord with manufacturer's product data and ACI 530.1-95. Bending reinforcement or bars after embedding in mortar or grout is prohibited.

B. Masonry joint reinforcement:
1. Install in single wythe masonry walls at 1'-4" O.C. vertically unless otherwise indicated. Lap side rods 6" minimum at splices.
2. Fully embed longitudinal rods in mortar for entire length with 5/8" minimum cover on exterior wall side and 1/2" minimum cover at other locations.
3. Stop reinforcement 1" back from expansion and control joints and openings in masonry walls.
4. Masonry openings over 1'-0" wide: Install reinforcement in first and second bed joint above and under openings with non-continuous reinforcement; extend 2'-0" beyond jamb, each side; bridge control joints.
5. Build in prefabricated "L" and "T" sections to provide continuity at corners and intersections.
6. Cut and bend units as indicated in manufacturer's installation instructions for continuity at returns, offsets, pipe enclosures, and special conditions.

END OF SECTION 04 080

SECTION 04 100 - MORTAR AND MASONRY GROUT

PART 1 - GENERAL

1.1 SUMMARY

A. Related sections:
1. Section 04080: Masonry Anchorage and Reinforcement.
2. Section 04220: Unit Masonry.
3. Section 08110: Steel Doors and Frames.

1.2 REFERENCES

A. Standards of the following as referenced:
1. American Concrete Institute (ACI).
2. ASTM.

B. Industry standards:
1. ACI 530.1-95: *Specifications for Masonry Structures*.

1.3 DEFINITIONS

A. Terms:
1. Cement-lime mortar: Separate bags for cement-lime combination or cement, lime, and coloring agents; requires addition of proportioned aggregate or sand and water for mix.
2. Masonry cement; definition from ASTM C219-90: "Hydraulic cement for use in mortars ...., containing one or more of the following materials: Portland cement, portland blast-furnace slag cement, portland-pozzolan cement, natural cement, slag cement, or hydraulic lime; and in addition usually containing one or more materials ....".
3. Packaged mortar cement: Measured quantities of masonry cement with below specified limitations, additives, and coloring agents, when specified, for colored mortar. Requires addition of proportioned aggregate or sand and water for mix.

1.4 SUBMITTALS

A. Product data: Manufacturer's product specifications and mixing and installation instructions for each manufactured product.

B. Samples: Submit actual mortar samples for colored mortar, 3/8” wide by 8” long, indicating color range of each color selected. Samples shall be made using cement brand and type, proportions and sand source proposed for work on this project.

C. Mix design: Submit mix design, including properties, materials and proportions, for mortar.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage and protection: Store materials under cover and off ground away from damp surfaces; remove wet or deteriorated bagged materials.

B. Deliver materials, except aggregate, in original unopened containers displaying product name, type, grade and mixing instructions.

1.6 QUALITY ASSURANCE

A. Qualifications: Use only one brand of cement for each type specified throughout Project.

B. Standards of the American Society for Testing and Materials (ASTM), as referenced herein.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pre-mixed, colored masonry cements:
   1. Acceptable products; pending compliance with specified characteristics and acceptable color range to match specified color:
      a. Citadel Cement Div. Medusa Corp.
      b. Custom Color Masonry Cement.
      c. Coplay Cement Col, Brixment –In-Color
      d. Holnam Rainbow Cement Products.
      e. Lehigh Portland Cement Company.
      f. National Cement Company, Inc.
      g. U.S. Cement Company Div. Blue Circle.
   2. Characteristics:
      a. ASTM C91-97.
      b. Admixtures containing calcium chloride are prohibited.
      c. Mortar type: Type S.
      d. Color: Standard colors as selected by Design Builder from samples formulated for Type S mortar; matching color selection.

B. Packaged cement-lime:
   1. Acceptable products:
      a. Holnam Inc.; Cement-Lime Type S MortaMix.
      b. C. Giant Cement Company; Eagle Bond.
   2. Characteristics:
      a. Packaged Portland cement and lime combination.
         1) Cement: ASTM C150-94, gray color.
         2) Hydrated lime: ASTM C207-91, Type S.

3) Admixtures containing calcium chloride are prohibited.

b. Mortar type: Type S.

C. Portland cement:
1. ASTM C150-94, gray color.
2. Normal weather and conditions: Type I.
3. Cold weather: Type III or Type IIIA.

D. Hydrated lime: ASTM C207-79 (1988), Type S.

E. Aggregate: Clean, hard, natural, washed sand; ASTM C144-93 and ASTM C404-94, Size No. 2, Natural.

F. Water: Clean, potable, free from deleterious amounts of alkalis, acids, and organic materials.

G. Non-shrink grout:
1. Acceptable products:
a. Anti-Hydro, Axpandcrete-S Hi-Flow.
b. Bostik Construction Products, Upcon Super Flow 263.
c. The Burke Company, Non-Ferrous, Non-Shrink Grout.
d. Lambert Corporation, Vibropruf #11.
e. Sonneborn Building Products, Sonogrout
f. U.S. Grout Corp.
g. W. R. Bonsal Co.
h. W.R. Meadows, Inc.
2. Characteristics: Flowable, non-metallic, controlled expansive type grout.

2.2 MIXES

A. Mortar proportions:
1. Proportion materials by volume in accord with ASTM C270-89 as follows.
2. Type S mortar:
a. Packaged mortar cements: One part Type S masonry cement to aggregate proportioned at not less than 2 nor more than three times volumes of Cementitous materials used OR;
b. Packaged mortar cements: 1 part Portland cement to one part Type N masonry cement to aggregate proportioned at not less than 2 nor more than three times volumes of Cementitous materials used OR;
c. Packaged cement-lime: One part packaged cement-lime mortar to aggregate proportioned at not less than 2 nor more than three times volumes of Cementitous materials used OR;
d. Cement, lime mortar: One part Portland cement and over to 2 parts Type S hydrated lime to aggregate proportioned at not less than 2 nor more than three times combined volume of cement and lime used.

B. Mixing:
   1. Mix mortar in power driven mixers. Mix three to five minutes after addition of materials.
   2. Mix mortar for glass unit masonry to slightly drier consistency than other mortar.
   3. Packaged mortar or packaged cement-lime mortar: Add aggregate and water in accord manufacturer's product data to achieve specified mortar strengths.
   4. Cement, lime mortar: Add aggregate and water in accord with manufacturer's product data to achieve specified mortar strengths.
   5. Addition of other admixtures including anti-freeze ingredients are prohibited.
   6. Measure aggregate in containers with known volume; measurement by shovels is prohibited.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
   1. Place mortar in sections indicated in SUMMARY Article.
   2. Retemper mortar to keep plastic; retempering glass unit masonry mortar is prohibited.
   3. Using mortar after setting has begun or after 2-1/2 hours has elapsed since initial mixing is prohibited.

B. Mortar type requirements:
   1. Mortar for concrete unit masonry work shall be Type S.
   2. Mortar for brick masonry shall be Type S, colored mortar.
   3. Mortar for ornamental stone work shall be Type S.

END OF SECTION 04 100

SECTION 04 200 - BRICK UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Brick unit masonry.
   2. Insulation in masonry walls.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 7 Section "Sheet Metal Flashing & Trim" for exposed sheet-metal flashing installed in masonry.
   2. Division 7 Section "Joint Sealants" for sealing joint in mockup.
   3. Division 4 Section “Mortar and Masonry Grout”
   4. Division 4 Section “Masonry Anchorage and Reinforcement”

C. Products installed but not furnished under this Section include the following:
   1. Steel lintels for unit masonry specified in Division 5 Section "Metal Fabrications."
   2. Steel shelf angles for unit masonry specified in Division 5 Section "Metal Fabrications."
   3. Wood nailers and blocking built into unit masonry specified in Division 6 Section "Rough Carpentry."
   4. Manufactured reglets in masonry joints for metal flashing specified in Division 7 Section "Sheet Metal Flashing & Trim."
   5. Hollow metal frames in unit masonry openings specified in Division 8 Section "Steel Doors and Frames."

1.3 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths (f'm) at 28 days.
   1. For Brick Unit Masonry: As follows, based on gross area:

      a. f'm = 1500 psi (10.3 MPa).

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each different masonry unit, accessory, and other manufactured product specified.

C. Samples for verification of the following:
   1. Full-size units for each different exposed masonry unit required showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
      a. Include size-variation data for Type FBX and Type FBS brick, verifying that actual range of sizes for brick falls within ASTM C 216 dimension tolerances.

1.5 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

B. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.

C. Mockup: Prior to installing unit masonry, construct sample wall panels to verify selections made under sample submittals and to demonstrate aesthetic effects as well as other qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.

   1. Locate mockups on site in the locations indicated or, if not indicated, as directed by Architect.
   2. Build mockup of typical wall area as shown on Drawings.
      a. Include exterior face brick wall with window opening framed with stone trim.
      b. Include window complying with requirements of Division 8 Section "Entrances and Storefronts."
      c. Seal perimeter of window complying with requirements of Division 7 Section "Joint Sealants."
      d. Include gutter and downspout complying with requirements of Division 7 Section "Sheet Metal Flashing & Trim."
      e. Include sealant-filled joint complying with requirements of Division 7 Section "Joint Sealants."
   3. Build mockups for the following types of masonry in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high by full thickness, including face and back-up wythes as well as accessories. Include a sealant-filled joint at least 16 inches (400 mm) long in each mockup.
      a. Typical exterior brick-veneer wall complete with metal studs, sheathing, veneer ties, flashing, and weep holes.
   4. Clean exposed faces of mockups with masonry cleaner indicated.
   5. Notify Architect one week in advance of the dates and times when mockups will be constructed.
   6. Protect accepted mockups from the elements with weather-resistant membrane.
   7. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
      a. Acceptance of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of
      workmanship; and other material and construction qualities specifically approved by Architect in writing.

b. Acceptance of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.
c. When directed, demolish and remove mockups from Project site.
d. Accepted mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until they are in an air-dried condition.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the following requirements:
1. Cold-Weather Construction: When the ambient temperature is within the limits indicated, use the following procedures:

a. 40 to 32 deg F (4 to 0 deg C): Heat mixing water or sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C).
b. 32 to 25 deg F (0 to -4 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry.
c. 25 to 20 deg F (-4 to -7 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F (4 deg C) if grouting. Use heat on both sides of walls under construction.
d. 20 deg F (-7 deg C) and Below: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F (4 deg C). Provide enclosures and use heat on both sides of walls under construction to maintain temperatures above 32 deg F (0 deg C) within the enclosures.

2. Cold-Weather Protection: When the mean daily temperature is within the limits indicated, provide the following protection:
a. 40 to 25 deg F (4 to -4 deg C): Cover masonry with a weather-resistant membrane for 48 hours after construction.
b. 25 to 20 deg F (-4 to -7 deg C): Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install wind breaks when wind velocity exceeds 15 mi./h (25 km/h).
c. 20 deg F (-7 deg C) and Below: Provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for 48 hours after construction.

3. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.

E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and above.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers:Manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
1. Brick:
a. Boral Brick Co.
b. Tristate Brick Co.
c. Palmetto Brick Co.

2.2 BRICK

A. General: Provide shapes indicated and as follows for each form of brick required.
   1. Provide units without cores or frogs and with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.

B. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
   1. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
   2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

C. Face Brick: ASTM C 216 and as follows:
   1. Grade and Unit Compressive Strength: Provide units with grade and minimum average net-area compressive strength indicated below:
      a. Grade: SW.
      b. 3000 psi (20.7 MPa).
   2. Initial Rate of Absorption: Between 5 and 20 g/30 sq. in. (g/194 sq. cm) per minute when tested per ASTM C 67.
   3. Surface Coloring: Brick with surface coloring, other than flashed or sand-finished brick, shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet (3 m).
   4. Type: FBS.
   5. Size: Bricks manufactured to the following actual dimensions within tolerances specified in ASTM C 216:
      a. Modular: 3-1/2 to 3-5/8 inches (89 to 92 mm) thick by 2-1/4 inches (57 mm) high by 11-1/2 to 11-5/8 inches long.
   6. Application: Use where brick is exposed, unless otherwise indicated.
   7. Color and Texture: Match Architect's samples.
   8. Products: Subject to compliance with requirements, provide one of the following:

      a. BRICK DESIGNATED ON DRAWINGS AS: 1-7 Iron Spot Smooth; **Taylor Brick as supplied by Boral Brick Co.**

D. Building (Common) Brick: ASTM C 62 and as follows:
   1. Grade and Unit Compressive Strength: Provide units with grade and minimum average net-area compressive strength indicated below:
      a. Grade: SW.
      b. 3000 psi (20.7 Mpa).
   2. Size: Bricks manufactured to the following actual dimensions within tolerances specified in ASTM C 216:
      a. Match size specified for face brick.
   3. Application: Use where brick is indicated for concealed locations.

2.3 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength, general-purpose cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry surfaces of type indicated below without discoloring or damaging masonry surfaces; expressly approved for intended use by manufacturer of masonry units being cleaned.
   1. For masonry not subject to metallic oxidation stains, use formulation consisting of a concentrated blend of surface-acting acids, chelating, and wetting agents.

2. For dark-colored masonry not subject to metallic oxidation stains, use formulation consisting of a liquid blend of surface-acting acids and special inhibitors.
3. For masonry subject to metallic oxidation stains, use formulation consisting of a liquid blend of organic and inorganic acids and special inhibitors.
4. Available Products: Subject to compliance with requirements, products that may be used to clean unit masonry surfaces include, but are not limited to, the following:
5. Products: Subject to compliance with requirements, provide one of the following:
   a. 202 New Masonry Detergent; Diedrich Technologies, Inc.
   b. 200 Lime Solv; Diedrich Technologies, Inc.
   c. 202V Vana-Stop; Diedrich Technologies, Inc.
   d. Sure Klean No. 600 Detergent; ProSoCo, Inc.
   e. Sure Klean No. 101 Lime Solvent; ProSoCo., Inc.
   f. Sure Klean Vana Trol; ProSoCo, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of thickness indicated.

B. Leave openings for equipment to be installed before completion of masonry. After installing equipment, complete masonry to match construction immediately adjacent to the opening.

C. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

D. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

E. Wetting of Brick: Wet brick prior to laying if the initial rate of absorption exceeds 30 g/30 sq. in. (g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb the water so they are damp but not wet at the time of laying.

3.3 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arises, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), nor 3/8 inch in 20 feet (10 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch in 40 feet

(12 mm in 12 m) or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet (6 mm in 3 m), nor 1/2 inch (12 mm) maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For top surface of bearing walls, do not exceed 1/8 inch (3 mm) in 10 feet (3 m), nor 1/16 inch (1.5 mm) within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed 1/2 inch in 20 feet (12 mm in 6 m), nor 3/4 inch in 40 feet (19 mm in 12 m) or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4 inch (6 mm) nor plus 1/2 inch (12 mm).

E. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch (3 mm). Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch (3 mm). Do not vary from collar-joint thickness indicated by more than minus 1/4 inch (6 mm) or plus 3/8 inch (10 mm).

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.

B. Lay walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
   1. One-half running bond with vertical joint in each course centered on units in courses above and below.

D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond or 1/3-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar prior to laying fresh masonry.

F. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
   1. At exterior frames, insert extruded polystyrene board insulation around perimeter of frame in thickness indicated, but not less than 3/4 inch (19 mm) to act as a thermal break between frame and masonry.

3.5 MORTAR BEDDING AND JOINTING

A. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not furrow bed joints or slush head joints.
   1. At cavity walls, slope beds toward cavity to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against cavity face of brick.

3.6 CAVITIES

A. Keep cavities clean of mortar droppings and other materials during construction. Strike joints facing cavities flush.
   1. Use wood strips temporarily placed in cavity to collect mortar droppings. As work progresses, remove strips, clean off mortar droppings, and replace in cavity.
   2. Provide temporary opening by omitting 1 brick every 48 inches (1200 mm) at bottom of cavity and in first course above flashing. After wall has been built to top of cavity and mortar has set, flush out cavity with a hose, allow to dry, and then close temporary opening.

B. Tie exterior wythe to back-up with individual metal ties. Stagger alternate courses.

3.7 CAVITY-WALL AND MASONRY-CELL INSULATION

A. On units of plastic board insulation, place small dabs of adhesive, spaced approximately 12 inches (300 mm) o.c., both ways on inside face or attach to inside face with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
   1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.8 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
   1. Provide an open space not less than 1 inch (25 mm) in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
   2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.9 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to metal studs with masonry-veneer anchors to comply with the following requirements:
   1. Fasten each anchor section through sheathing to metal studs with 2 metal fasteners of type indicated.
   2. Fasten anchors through sheathing to metal studs with metal fasteners of type indicated.
   3. Insert anchor section in metal studs as sheathing is installed. Provide one anchor at each stud in each horizontal joint between sheathing boards.

4. Embed tie section in masonry joints. Provide not less than 2-inch (50-mm) air space between back of masonry veneer and face of sheathing.
5. Locate anchor section relative to course where tie section is embedded to allow maximum vertical differential movement of tie up and down.
6. Space anchors as indicated, but not more than 18 inches (458 mm) o.c. vertically and 24 inches (610 mm) o.c. horizontally with not less than 1 anchor for each 2 sq. ft. (0.2 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals around perimeter not exceeding 8 inches (203 mm).

3.10 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

B. Form expansion joints in brick made from clay or shale as follows:
1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches (100 mm) in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints, if any.
2. Build flanges of factory-fabricated, expansion-joint units into masonry.
3. Build-in joint fillers where indicated.
4. Form open joint of width indicated, but not less than 3/8 inch (10 mm) for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants." Maintain joint free and clear of mortar.

C. Build-in horizontal pressure-relieving joints where indicated; construct joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants."
1. Locate horizontal pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

3.11 LINTELS

A. Install steel lintels where indicated.

B. Provide minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.

3.12 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.

B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer before covering with mortar.

C. Install flashing as follows:
1. At masonry-veneer walls, extend flashing from exterior face of veneer, through the veneer, up face of sheathing at least 8 inches (200 mm), and behind air-infiltration barrier/building paper.

2. At lintels and shelf angles, extend flashing a minimum of 4 inches (100 mm) into masonry at each end. At heads and sills, extend flashing 4 inches (100 mm) at ends and turn up not less than 2 inches (50 mm) to form a pan.
3. Interlock end joints of ribbed sheet-metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements of Division 7 Section "Joint Sealants" for application indicated.
4. Extend sheet-metal flashing 1/2 inch (13 mm) beyond face of masonry at exterior and turn down to form a drip.
5. Cut off flashing flush with face of wall after masonry wall construction is completed.

D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:
1. Form weep holes with product specified in Part 2 of this Section.
2. Space weep holes 24 inches (600 mm) o.c.
3. Space weep holes 16 inches (400 mm) o.c.
4. In insulated cavities, cover cavity side of open weep holes with copper or plastic insect screening before placing loose-fill masonry insulation in cavity.

E. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.

3.13 FIELD QUALITY CONTROL

A. Mortar composition and properties will be evaluated per ASTM C 780.

B. Grout will be sampled and tested for compressive strength per ASTM C 1019.

C. Evaluation of Quality-Control Tests: In the absence of other indications of noncompliance with requirements, masonry will be considered satisfactory if results from construction quality-control tests comply with minimum requirements indicated.

3.14 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.

4. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean brick by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised, using the following masonry cleaner:
   a. Job-mixed detergent solution.

E. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

END OF SECTION 04 200

SECTION 04 220 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

A. This Section covers all labor, materials, accessories, scaffolding and appliances necessary for the completion of all unit masonry Work.
   1. All masonry units shall be modular in size.

B. Related Work Specified Elsewhere:
   1. Division 7 Section “Flashing and sheet Metal” for exposed sheet-metal flashing installed in masonry.
   2. Division 7 Section “Joint Sealants” for sealing joint in mockup.
   3. Division 8 Section “Aluminum Store Front and Entrances” for window in mockup”.
   4. Division 4 Section “Masonry Anchorage & Reinforcement.
   5. Division 4 Section “Mortar & Masonry Grout”.
   6. Division 4 Section “Brick Unit Masonry”.

C. Products installed but not furnished under this Section include the following:
   1. Steel shelf angles for unit masonry specified in Division 5 Section “Metal Fabrications.”
   2. Wood nailers and blocking built into unit masonry specified in Division 6 Section “Rough Carpentry.”
   3. Manufactured reglets in masonry joints for metal flashing specified in Division 7 Section “Flashing and Sheet Metal.”
   4. Hollow metal frames in unit masonry openings specified in Division 8 “Standard Steel Doors and Frames.”

1.3 QUALITY ASSURANCE

A. Job Mock-Up:
   1. Erect before the installation of any cmu, and for review by the Owner, a sample panel 6 feet (1.5 m) long by 4 feet (1.2 m) high and of the proper thickness, showing proposed color range, texture, bond, mortar joint and workmanship for cmu work. No Work shall proceed until the Architect and/or Owner has reviewed and approved the sample panel. The panel shall then become the standard of quality for all cmu work. Do not destroy or move the panel until the work is complete.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until they are in an air-dried condition.

B. Store cementitious materials on elevated platforms, under cover and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.5 JOB CONDITIONS

A. Environmental Requirements:
1. Freezing Weather. Do not lay masonry when the temperature of the outside air is below 40 degrees F. (5 degrees C.), unless means to heat and maintain the temperature of the masonry materials are reviewed by the Architect. Protect the completed Work from freezing.
2. Method of Wetting Clay Masonry Units. Insure that each unit is nearly saturated and surface dry when laid. During freezing weather, sprinkle with warm water just before laying units that require wetting.
a. Do not wet concrete masonry units.

B. Protection:
1. Keep all walls dry during erection by covering at the end of each day or shutdown period with a strong, waterproof membrane. Similarly protect at all times partially completed walls not being worked on.

1.6 SUBMITTALS

A. General: Submit each item in the Article according o the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each different masonry unit, accessory, and other manufactured product specified.

C. Shop drawings for stone trim in the form of cutting and setting drawings showing sizes, profiles, and locations of each stone trim unit required.

D. Submit samples for verification of the following:
1. Full-size units for each different exposed masonry unit required showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
2. Colored-masonry mortar samples for each color required showing the full range of colors expected in the finished construction. Make samples using the same sand

and mortar ingredients to be used on the Project. Label samples to indicate type and amount of colorant used.

3. Weep holes/vents in color to match mortar color.

E. List of Materials Used in Construction Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to specifically identify exact materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor acceptance of mockup constitutes approval of deviations from Contract Documents unless such deviations are specifically brought to the attention of the Architect and approved in writing.

1.7 QUALITY ASSURANCE

A. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.

B. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source of producer for each aggregate.

C. Mockup: Prior to installing unit masonry, construct sample wall panels to verity selections made under sample submittals and to demonstrate aesthetic effects as well as other qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of work.

1. Locate mockups on site in the locations as directed by Architect.
2. Build mockup of typical wall area as shown on Drawings.
3. Include exterior face CMU wall with window opening framed with precast concrete trim.
4. Include window complying with requirements of Division 8 Section "Aluminum Design Architectural Windows."
5. Seal perimeter of window complying with requirements of Division 7 Section "Joint Sealants."
6. Include sealant-filled joint complying with requirements of Division 7 Section "Joint Sealants."

D. Clean exposed faces of mockups with masonry cleaner indicated.

E. Notify Architect one week in advance of the dates and times when mockups will be constructed.

F. Protect accepted mockups from the elements with weather-resistant membrane.

G. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.

1. Acceptance of mockups is for color, texture, and blending of masonry units: relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

2. Acceptance of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.
3. When directed, demolish and remove mockups from Project site.
4. Accepted mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

PART 2 - PRODUCTS

2.1 MAUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Trenwyth Industries, Inc.
2. Dillon & Company.

B. Concrete Masonry Units (CMU).
1. Load-bearing units shall conform to ASTM C 90.
2. Nonload-bearing units shall conform to ASTM C 129.
4. Grade N-1 for use in exterior walls below grade, exposed to weather or exposed to frost action.
5. Grade S-1 for use above grade not subject to frost action.
6. Use load-bearing units for exterior walls, for the interior wythe of exterior cavity walls and for interior load-bearing walls.
7. Concrete masonry units shall be modular in size and of thickness called for on the Drawings.
8. Special shapes, shall include two (2) faced ground corner units, 6" block-2 faced at window jambs, and U-blocks for beams and lintels, shall be furnished as shown or as required.
10. Finish: Exposed faces of the CMU shall be of lightweight aggregate split faced. Color and pattern shall be Premier Line Flint 14-02 as manufactured by Dillon & Company. Units shall be installed as shown on the drawings. Provide units made with aggregate matching aggregate in Architect's sample.

PART 3 - EXECUTION

3.1 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

A. General Masonry Installation:
1. Horizontal joints shall be level, vertical joints plumb, and faces of masonry flush.
2. Mortar Bedding. Place mortar bedding under the face shells of units, but not extended across the webs, except that full mortar bedding is required under the starting course laid on footings or solid foundation walls and in all load-bearing piers, columns and pilasters, and for securing hollow metal door frames to CMU walls and partitions.

B. Neatly strike and clean off with clean stiff brushes as the Work progresses, all joints in the face of all walls and partitions, including pipe and vent shafts, which are covered with wallboard.

1. Cutting of Masonry Units. Use a carborundum wheel for cutting so all junction joints are carefully and accurately fitted, where it is necessary to cut masonry units to fit against other special construction, as indicated.

2. Metal Frames. Anchor metal frames to the partitions as specified under Section 08110, HOLLOW METAL DOORS AND FRAMES. Completely slush full with mortar, the space between the masonry and the metal frames.

C. Do all cutting and patching necessary, build in all bucks and framing Work, all anchors, sleeves, metal nailing plugs, anchor bolts, etc., and do all other miscellaneous Work occurring in connection with the masonry Work, whether mentioned in detail or not.

1. Hollow masonry units to be filled with concrete shall have a strip of close-mesh expanded metal lath 2.5 lb. (1.134 kg) in the joint immediately below.
2. Wood Buck Anchors. Build in as the masonry Work proceeds and anchor to masonry by means of strap anchors, spaced not over 2 feet (600 mm) apart. Anchors shall be 1/4 inch x 1-1/2 inches (6.3 mm x 38 mm), screwed to bucks, extended over the first vertical joint in the masonry and bent 2 inches (50 mm) down into the joint.
3. Exposed mortar head and bed joints in modular masonry walls shall have a thickness equal to the difference between the actual dimension and the nominal dimension of the unit in either height or length, but in no case less than 1/8 inch (3 mm) nor more than 3/4 inch (20 mm).
4. Joining of Work. Clean and lightly wet exposed surface of the set masonry where fresh masonry joins masonry that is partially or totally set. Remove all loose masonry and mortar. Rack back one-half masonry unit length in each course and, if grout is used, stop grout 4 inches (100 mm) back of rack if it becomes necessary to 'stop off' a horizontal run of masonry. Toothing will not be permitted except when specifically indicated.
5. Flashing. Surfaces of masonry shall be smooth and free from projections which might puncture the flashing material when flashing is to be laid on or against masonry.
   a. Flashings shall extend 6 inches (150 mm) minimum above top of mortar deflectors.
6. Tooling and Pointing. Tool with a round or other jointer, masonry unit mortar joints which are exposed and have become 'thumbprint' hard. Jointer to be slightly larger than the width of the mortar joint, so that a complete contact is made along the edges of the units, compressing and sealing the surface of the joint. Trowel-point exterior joints below grade and flush cut all other joints not tooled.
7. Bonding. Lay exposed masonry walls in standard running bond, except as otherwise indicated on the Drawings. Lap by at least 3 inches (75 mm) all vertical joints in unexposed masonry.
   a. Tie all soap tiles to walls with galvanized wall ties, one tie in every two square feet of tile surface.
   b. Where facing tile is used over concrete walls, tie thereto with galvanized anchors set in embedded slots at rate of one anchor to each two square feet (0.18 square meters) of wall.

D. Miscellaneous Steel Items.

1. Wall and Beam Plates. Set and grout to correct grade and line, all loose bearing plates for beams, girders, lintels or other structural steel which will bear on masonry.
2. Loose Lintels. Solidly build in place, loose lintels bearing on or supporting masonry.
   a. Provide slip sheet of 15 pound (1.46 K per square meter) building felt or 4 mil (0.1 mm) polyethylene between top of brick and bottom of loose lintel.
3. Anchor Bolts. Set and build in all anchor bolts for column base plates and other base plates anchored to masonry.
4. Miscellaneous steel items exposed within cavities of exterior walls shall be galvanized unless coated with bituminous paint as required elsewhere in this Specification.

E. Wall Reinforcing. Use wall reinforcing every 16 inches (400 mm) in height in the following walls.
1. All Concrete Masonry Units.
2. All masonry laid in stack bond.
3. All masonry walls constructed in two or more wythes.
4. Any other walls indicated on the Drawings.

F. Anchoring of Masonry.
1. Where nonbearing masonry walls or partitions abut other masonry walls or partitions, bond together as they are built up, or tie together with strips of metal lath or 14 inch (6 mm) mesh hardware cloth placed across the joint between the two walls. Strips to be at 16 inch (400 mm) vertical centers maximum.
2. Tie masonry which abuts steel with crimped galvanized ties secured to steel by flexible type connections.
3. Tie masonry which abuts concrete with dovetail slots embedded in concrete.
4. Bond together interior bearing masonry walls where they abut other masonry walls. Provide lateral support with rigid steel anchors as specified before. Embed bends at the ends of the bars in cores filled with mortar. Rake the joint at intersection of the walls out 1/2 inch (12 mm), unless otherwise detailed. Seal joint with sealant, unless otherwise indicated.
   a. Masonry Facing. Tie masonry facing laid against concrete walls, columns, etc., thereto with galvanized anchors in embedded slots at the rate of one anchor for each two square feet (0.18 square m) of wall area.

G. Control Joints (CJ). Provide control joints (CJ) in all masonry walls at intervals as shown on the Drawings. Continue control joints vertically through bond beams and masonry wall reinforcing unless otherwise shown on the Drawings. Provide control joints at all breaks in bond beams. Rake control joint 3/4 inch (19 mm) deep.

H. Expansion Joints (EJ). Provide expansion joints (EJ) in the exterior wythe of all exterior masonry cavity walls at intervals as shown on the Drawings. Joint shall be 3/8 inch (10 mm) wide filled with expansion joint filler recessed 1/2 inch (12 mm) from the exterior face and sealed with sealant.

I. Cavity Walls.
1. Construct cavity walls as shown with masonry facing and backing separated by a continuous air space. Facing shall be tied to back-up with wall reinforcing installed on bed joints every 16-inches (400 mm) in height.

2. Keep cavity and weep holes clear of mortar by installing mortar deflectors at all locations in wall cavities directly above through-wall flashings and weep holes in accordance with manufacturer's directions.
   a. Material shall fill air space between wythes of masonry or between brick veneer and insulation. Provide multiple thicknesses to fill air space as required.
3. Flash cavity at bottom, over all openings, and wherever cavity is interrupted, with cavity wall flashing. Turn up flashing ends to form end dams to prevent water from dripping into the cavity.
4. Weep holes Space full open head joints at 24 inches (600 mm) o.c. and leave immediately above flashing.
   a. Dependent upon the face brick size, weep openings of 3/8 inch (9.5 mm) O.D., and spaced at not over 16 inches (400 mm) apart may be needed.
5. Cavity Wall Insulation. Lay cavity wall insulation in accordance with manufacturer's recommendations. Joints in insulation shall be tight and insulation shall fit tightly around wall reinforcing.

J. Nonbearing Partitions.
1. Where suspended ceilings do not occur and elsewhere as indicated, extend nonbearing partitions from the top of the structural floor to the bottom surface of the construction above. Topmost joint shall be 1 inch (25 mm) thick compressible filler. Unless shown otherwise, anchor top of partition with an 8 inch (200 mm) long x 0.1046 inch (3 mm) x width of the wall channel with 3 inch (75 mm) outstanding legs anchored to the structure in two places and at 4-foot (1.2 m) centers.
2. Where suspended ceilings are used, nonbearing partitions shall extend 6 inches (150 mm) above ceiling, unless otherwise indicated.

3.2 FIELD QUALITY CONTROL

A. The Architect may direct the Contractor to remove masonry already laid to assure himself that all joints are full. If he finds joints that are not completely filled, he can order masonry removed until he is assured the joints of all remaining masonry are completely filled.

B. Defective Unit Masonry.
1. Cracked, chipped, warped or otherwise defective masonry units shall not be used in finished work exposed to view.
2. All warped, chipped or otherwise defective structural glazed facing tile (FTG) will be rejected.

3.3 ADJUSTMENT AND CLEANING

A. Upon completion of the masonry work or when danger from defacement from further building operations exists, inspect all pointing and repoint imperfections. Carefully clean dirt, mortar, stains, and defacements from masonry exposed to view. Disintegration or discoloration of mortar or adjacent materials shall not be permitted by the use of wire brushes, strong acids, or other solutions. Begin at top continuing down until cleaning operation is finished.

END OF SECTION 04 220

SECTION 04 400 - ORNAMENTAL STONE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section covers all labor, materials, accessories, scaffolding and appliances necessary for the completion of all Stone Work.

1.02 RELATED SECTIONS

A. Section04100: Mortar and Masonry Grout

B. Section 04220: Concrete Unit Masonry

C. Section 04080 Masonry Anchorage & Reinforcement

1.03 SUBMITTALS

A. Submit 2 typical size stones from selected source to show range of color, texture, hardness and dimensions to be expected in the completed construction.

B. Do not proceed with masonry construction until sample is accepted by Architect.

C. General: Submit each item in the Article according to the Conditions of the Contract and Division 1 Specification Sections.

D. Product data for each different masonry unit, accessory, and other manufactured product specified.

E. Shop drawings for stone trim in the form of cutting and setting drawings showing sizes, profiles, and locations of each stone trim unit required.

F. List of Materials Used in Construction Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to specifically identify exact materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor acceptance of mockup constitutes approval of deviations from Contract Documents unless such deviations are specifically brought to the attention of the Architect and approved in writing.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store stone off ground to prevent contamination by mud, dust, or materials likely to cause staining or other defects.

B. Cover materials as necessary to protect from elements.

C. Protect anchors, ties, and reinforcement from elements.

1.05 PROJECT CONDITIONS

A. Cold Weather Conditions.

1. Do not place stone masonry when air temperature is below 40 degrees F (4 degrees C).

B. Hot Weather Conditions.

1. Protect masonry construction from direct exposure to wind and sun when erected in an ambient air temperature above 99 degrees F (37 degrees C) in the shade with relative humidity less than 50 percent.

1.6 QUALITY ASSURANCE

A. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.

B. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source of producer for each aggregate.

C. Mockup: Prior to installing unit masonry, construct sample wall panels to verity selections made under sample submittals and to demonstrate aesthetic effects as well as other qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of work.

1. Locate mockups on site in the locations as directed by Architect.
2. Build mockup of typical wall area as shown on Drawings.
3. Include exterior face CMU wall.
4. Include sealant-filled joint complying with requirements of Division 7 Section “Joint Sealants.”

D. Clean exposed faces of mockups with masonry cleaner indicated.

E. Notify Architect one week in advance of the dates and times when mockups will be constructed.

F. Protect accepted mockups from the elements with weather-resistant membrane.

G. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.

1. Acceptance of mockups is for color, texture, and blending of masonry units: relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
2. Acceptance of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.
3. When directed, demolish and remove mockups from Project site.
4. Accepted mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

H. Preinstallation Conference: Conduct conference at Project site to comply with

PART 2 - PRODUCTS

2.01 MATERIALS

A. Stone.

1. “Mojave Country Ledgestone (CSV-20042)” as Manufactured by Cultured Stone a Division of Owens Corning used as standard of quality. Local distributors: Alley Cassetty Brick; tele: 770.245.1234; Daco Enterprises, tele: 770..2425, Jimco Stone Centers, tele: 770.422.5371
2. All other Manufacturers meeting the specifications may submit their product for approval.
3. Furnish stacked stone of approved quality, sound, free from structural defects and free from earth, clay or other foreign substances.

4. Provide stones for flatwork of not less than 2 inches thick, length of not more than 8 times the thickness, and width of not less than 3 times the thickness.

PART 3 - EXECUTION

3.01 CONSTRUCTION

A. Setting.
   1. Do not use wet stones.
   2. Lay large stones in bottom courses.
   3. Fill all voids with mortar, or stone.
   4. Arrange stone compactly and in such manner as to key firmly.
   5. Set top course at uniform elevation.

B. Mortar Joints.
   1. Lay stones with an average of 3/4 inch wide joints. At intersection of more than 3 stones, provide 1-1/2 inch maximum joints.
   2. Rake mortar joints in walls to a depth of 1/2 to 3/4 inch.

C. Maximum Allowable Tolerances.
   1. Variation from plumb: 1 inch.
   2. Variation from building line: 1 inch.
   3. Variation in wall thickness to average face plane: 1 inch.

D. Pointing and Cleaning.
   1. Cut out any defective joints and holes in exposed masonry and repoint with mortar.
   2. Clean exposed masonry with stiff brush and clear water.
   3. Leave work area and surrounding surfaces clean and free of mortar spots, droppings and broken masonry.

E. Waterproofing.
   1. After cleaning, apply 2 coats of silicone waterproofing according to manufacturer's instructions.

END OF SECTION 04 400

SECTION 05 120 - STRUCTURAL STEEL

PART 1 GENERAL

1.01 SUMMARY

A. Section includes structural steel framing members, support members; base or bearing plates; anchor bolts for structural steel; beams, girders; bearing of steel for girders, columns, posts; connecting materials for framing structural steel to structural steel; leveling plates, wedges, shims, and leveling screws; lintels, when attached to structural steel frame; trusses; and grouting under base plates.

B. Related Sections:
1 Section 05310 - Steel Deck.

1.02 REFERENCES

A. AISC (American Institute of Steel Construction) - Specification for Structural Steel Buildings, Allowable Stress Design (ASD).

B. AISC (American Institute of Steel Construction) - Code of Standard Practice for Structural Steel Buildings and Bridges.

C. AISC (American Institute of Steel Construction) - Seismic Provisions for Structural Steel Buildings.

D. ASTM A36/A36M - Carbon Structural Steel.

E. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

F. ASTM A123 - Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products.

G. ASTM A992

H. ASTM A307 - Carbon Steel Bolts and Studs, 60 ksi Tensile Strength.

I. ASTM A325 - Structural Bolts, Steel, Heat-Treated, 120/105 ksi Minimum Tensile Strength.

J. ASTM A490 - Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.

K. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

L. ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

M. ASTM A572/A572M - High-Strength, Low-Alloy Columbium-Vanadium Structural Steel.

N. AWS A2.4 (American Welding Society) - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

O. AWS D1.1 (American Welding Society) - Structural Welding Code - Steel.

P. FM (Factory Mutual) - Roof Assembly Classifications.

Q. RCSC (Research Council on Structural Connections) - Specification for Structural Joints Using ASTM A325 or A490 Bolts, LRFD or ASD.

R. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual, Volumes 1 and 2.

S. UL (Underwriters Laboratory, Inc.) - Fire Resistance Directory.

T. WH (Warnock Hersey) - Certification Listings.

1.03 SUBMITTALS

A. Shop Drawings:
1 Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
2 Connections.
3 Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

B. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

1.04 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC Code of Standard Practice.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manufacturers:
Shall be domestic steel.

B. Structural Steel Members: ASTM A572 or ASTM A-992 Grade 50.

C. Structural Tubing: ASTM A500, Grade _B

D. Pipe: ASTM A53, Grade B.

E. Bolts, Nuts, and Washers: ASTM A307. ASTM A325 bolts, galvanized to ASTM A123 for galvanized structural members.

F. Anchor Bolts: ASTM A307.

G. Welding Materials: AWS D1.1; type required for materials being welded.

H. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing minimum compressive strength of 5,000 psi at 28 days.

I. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.

2.02 FABRICATION

A. Continuously seal joined members by intermittent welds and plastic filler. Grind exposed welds smooth.

B. Fabricate connections for bolt, nut, and washer connectors.

C. Develop required camber for members.

2.03 FINISH

A. Prepare structural component surfaces in accordance with SSPC SP

B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete.

C. Galvanize structural steel members to ASTM A123. Furnish minimum 2 oz/sq ft galvanized coating.

PART 3 EXECUTION

3.01 ERECTION

A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.

B. Field weld components indicated on Drawings.

C. Field connect members with threaded fasteners; torque to required resistance tighten to snug tight for bearing type connections.

D. Do not field cut or alter structural members without written approval of a Structural Engineer Registered in the State of Georgia.

E. After erection, prime welds, abrasions, and surfaces not shop primed galvanized, except surfaces to be in contact with concrete.

F. Grout under base plates. Trowel grouted surface smooth, splay neatly to 45 degrees.

3.02 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From Alignment: 1/4 inch.

END OF SECTION 05 120

SECTION 05 310 - STEEL DECK

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes steel deck units for floor and roof applications.

1.02 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data including manufacturer's specifications, catalog cuts, sectional properties and installation instructions for each type of decking and accessories. Include manufacturer's certification as required to show compliance with these specifications.

1. Provide test data for mechanical fasteners used in lieu of welding for fastening deck to supporting structures.

C. Shop drawings showing layout and types of deck units, anchorage details, and conditions requiring closure strips, supplementary framing, sump pans, cant strips, cut openings, special jointing, and other accessories.

1. Deck fabricator is responsible to coordinate his work with other trades involved before submitting shop drawings.

1.03 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes and standards, except as otherwise indicated:

1. American Iron and Steel Institute (AISI), ninth edition, "Specification for the Design of Cold-Formed Steel Structural Members."

2. American Welding Society (AWS), latest edition, D1.3 "Structural Welding Code - Sheet Steel."

3. Steel Deck Institute (SDI), latest edition, "Design Manual for Composite Decks, Form Decks and Roof Decks."

B. Underwriters' Label: Provide metal floor deck units listed in Underwriters' Laboratories "Fire Resistance Directory" with each deck unit bearing the UL label and marking for specific system detailed.

C. FM Listing: Provide metal roof deck units which have been evaluated by Factory Mutual System and are listed in the "Factory Mutual Approval Guide" for Class I fire rated construction.

D. Qualification of Field Welding: Use qualified welding processes and welding operators in accordance with "Welder Qualification" procedures of AWS.

1. Welded decking in place is subject to inspection and testing. The Government will bear expense of removing and replacing portions of decking for testing purposes if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to the following:

1. United Steel Deck , Inc
2. Vulcraft/Nucor Corporation
3. Wheeling Corrugating Co
4. Epic Metal Deck
5. Substitutions: See Section 01600 - Product Requirements.

2.02 MATERIALS

A. Steel for Galvanized Steel Deck Units: ASTM A 446, grade as required to comply with SDI specifications.

B. Miscellaneous Steel Shapes: ASTM A 36.

C. Shear Connectors: Headed stud type, ASTM A 108, Grade 1015 or 1020, cold-finished carbon steel, with dimensions complying with AISC specifications.

D. Sheet Metal Accessories: ASTM A 526, commercial quality, galvanized.

E. Galvanizing: ASTM A 525, G90.

F. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.

G. Paint: Manufacturer's baked-on, rust-inhibitive paint, for application to metal surfaces that have been chemically cleaned and phosphate chemical treated.

H. Flexible Closure Strips: Manufacturer's standard vulcanized, closed-cell, synthetic rubber.

2.03 FABRICATION

A. Roof Deck Units: Provide deck configurations that comply with SDI "Specifications and Commentary for Steel Roof Deck."

1. See structural drawings for size, type, and minimum required section properties.

B. Composite Steel Floor Deck: Fabricate deck units with integral embossing or raised pattern to furnish mechanical bond with concrete slabs. Fabricate open-beam deck units with fluted section having interlocking side laps.

1. See structural drawings for size, type, and minimum required section properties.

C. Metal Closure Strips: Fabricate metal closure strips, for cell raceways and openings between decking and other construction, of not less than 0.045-inch min. (18 gage) sheet steel. Form to provide tight-fitting closures at open ends of cells or flutes and sides of decking.

D. Roof Sump Pans: Fabricate from single piece of 0.071-inch min. (14 gage) galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3 inches wide. Recess pans not less than 1-1/2 inches below roof deck surface unless otherwise shown or required by deck configuration. Holes for drains will be cut in the field by others.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install deck units and accessories in accordance with manufacturer's recommendations, shop drawings, and as specified herein.

B. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.

C. Align deck units for entire length of run of cells and with close alignment between cells at ends of abutting units.

D. Place deck units flat and square, secured to adjacent framing without warp or deflection.

E. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.

F. Do not use floor deck units for storage or working platforms until permanently secured. Do not overload.

3.02 FASTENING DECK UNITS

A. Fasten floor deck units to steel supporting members by not less than 5/8" diameter (effective fusion diameter) puddle welds at spacing indicated on drawings, but not more than 12 inches o.c. with a minimum of 4 welds per unit at each support.

B. Tack weld or use self-tapping No. 8 or larger machine screws at 4 feet o.c. for fastening end closures.

C. Floor deck side lap connections to be welded at spacing indicated on drawings, but not more than 24" o. c. Provide minimum 2" end laps.

D. Fasten roof deck units to steel supporting members by not less than 5/8" diameter (effective fusion diameter) puddle welds at spacing indicated on drawings, but not less than three 5/8" diameter welds for 24" wide sheet at each support.

E. Fasten steel roof deck sheets together along sidelaps with minimum No. 10 self-drilling screws at 24" 0.c. maximum spacing. Provide minimum 2" end laps.

F. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.

G. Uplift Loading: Install and anchor roof deck units to resist net uplift indicated on drawings with gross minimum uplift loading of 30 lbs. per square foot.

3.03 ACCESSORIES AND MISCELLANEOUS

A. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking, as shown.

B. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work shown.

C. Hanger Slots or Clips: Provide UL-approved punched hanger slots between cells or flutes of lower element where floor deck units are to receive hangers for support of ceiling construction, air ducts, diffusers, or lighting fixtures.

1. Hanger clips designed to clip over male side lap joints of floor deck units may be used instead of hanger slots.

2. Locate slots or clips at not more than 14" o.c. in both directions, not over 9" from walls at ends, and not more than 12" from walls at sides, unless otherwise indicated.

3. Provide manufacturer's standard hanger attachment devices.

D. Joint Covers: Provide metal joint covers at abutting ends and changes in direction of deck units, except where taped joints are required.

E. Roof Sump Pans: Place over openings provided in roof decking and weld to top decking surface. Space welds not more than 12" o.c. with at least one weld at each corner. Cut opening in roof sump bottom to accommodate drain size indicated.

F. Cant Strips: Weld to top surface of roof decking and secure to wood nailers with galvanized nails and to steel framing with welds at 12" o.c. Lap end joints not less than 3" and secure with galvanized sheet metal screws.

G. Closure Strips: Provide metal closure strips at open uncovered ends and edges of roof decking and in voids between decking and other construction. Weld into position to provide a complete decking installation.

1. Provide flexible closure strips instead of metal closures, at Contractor's option, wherever their use will ensure complete closure. Install with adhesive in accordance with manufacturer's instructions.

3.04 SHEAR CONNECTORS

A. Shear Connectors: Weld shear connectors to supports through decking units in accordance with manufacturer's instructions. Do not weld shear connectors through two layers (lapped ends) of decking units. Weld only on clean, dry deck surfaces.

3.05 TOUCH-UP

A. Touch-Up Painting: After decking installation, wire brush, clean, and paint scarred areas, welds, and rust spots on top and bottom surfaces of decking units and supporting steel members.

1. Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.

3.06 FIELD QUALITY CONTROL

A. Testing of Shear Connectors: Before starting any stud welding operation, or after the welding equipment has been moved, changed or remained idle for a period of time, trial or test studs should be welded for testing as follows by the Contractor:

1. Weld two test studs at start of each daily production period and for each welding apparatus used to determine proper weld setup. Test studs by bending to an angle of 45 degrees from the vertical with out weld failure. If failure occurs in the weld zone of either stud, correct or adjust setup and repeat test. Two consecutive studs must be successfully welded and satisfactorily tested before any production studs are welded.

2. Throughout the day provide and test 12 additional studs per each welding apparatus used. Provide one regular stud for every bent one so that the number of studs per beam is not reduced.

3. Provide and pay for an independent testing laboratory acceptable to the Owner/Construction Manager to visually inspect all studs to check for full fusion or a full 360 degree weld fillet. Studs that fail test shall be replaced and retested. For each stud that fails, three additional studs shall be tested.

4. Testing of additional studs and retesting shall be performed at Contractor's expense.

B. Deck Welding: Visually inspect all deck welding in addition to above testing and inspection of shear connectors.

END OF SECTION 05 310

SECTION 05 500 - METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Provide metal fabrications.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.
1. Shop drawings shall be prepared and stamped by a qualified engineer licensed in the jurisdiction of the project.

C. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers: ACI Distribution (VVP America, Inc.); ACL Industries, Inc.; ALACO Ladder Co.; American Railing Systems, Inc.; Cambridge Architectural Mesh; Embury Co.; Jomy Products, Inc.; O'Keeffe's, Inc.; Screen America Motorized Screens; Sharon Companies Ltd.; Taco Metals, Inc.

B. Metal Fabrication Applications:
1. Application: Rough hardware.
2. Application: Loose steel lintels.
3. Application: Miscellaneous framing and supports for overhead doors and grilles.
4. Application: Miscellaneous framing and supports for suspended toilet partitions.
5. Application: Steel framing and supports for countertops.
6. Application: Steel angle corner guards.
7. Application: Pipe bollards.

C. Ferrous Materials:
1. Steel Plates, Shapes and Bars: ASTM A 36.
2. Rolled Steel Floor Plates: ASTM A 786.
3. Steel Tubing: ASTM A 500 or A 501.
4. Uncoated Structural Steel Sheet: ASTM A 611 or A 570.
5. Uncoated Steel Sheet: ASTM A 366 or A 569.
6. Galvanized Steel Sheet: ASTM A 653, G90.

7. Steel Pipe, Black Finish: ASTM A 53.
8. Steel Pipe, Galvanized Finish: ASTM A 53.
9. Gray Iron Castings: ASTM A 48, Class 30.
10. Malleable Iron Castings: ASTM A 47, Grade 32510.
11. Reinforcing Bars: ASTM A 615, Grade 60.
12. Brackets, Flanges, and Anchors: Cast or formed metal.
13. Concrete Inserts: Threaded or wedge type.
14. Welding Rods and Bare Electrodes: AWS specifications.
15. Zinc-Coating: Hot-dip galvanized coating for materials in exterior assemblies or exterior walls.

D. Stainless Steel Materials:
1. Bar Stock: ASTM A 276, Type 302 or 304.
2. Plate: ASTM A 666, Type 302 or 304.
3. Rolled-Steel Floor Plate: ASTM A 786.

E. Aluminum Materials:
1. Extruded Bars and Shapes: ASTM B 221 aluminum alloy.
2. Rolled Tread Plate: ASTM B 632 aluminum alloy.
3. Rivets: ASTM B 316, aluminum alloy.
4. Sheet for Expanded Aluminum Grating: ASTM B 209.
5. Fasteners: ASTM A 153.
6. Finish: Clear anodized.

F. Fasteners:
1. Bolts and Nuts: Hexagon head type, ASTM A 307, Grade A.
2. Lag Bolts: Square head, FS FF-B-561.
3. Machine Screws: Cadmium plated steel, FS FF-S-92.
4. Wood Screws: Flat head carbon steel, FS FF-S-111.
5. Plain Washers: Round carbon steel, FS FF-W-92.
6. Drilled-In Expansion Anchors: FS FF-S-325.
7. Toggle Bolts: Tumble-wing type, FS FF-B-588.
8. Lock Washers: Spring type carbon steel, FS FF-W-84.
9. Zinc-Coating: Fasteners in exterior assemblies or exterior walls.

G. Auxiliary Materials:
1. Nonshrink Metallic Grout: ASTM C 1107.
2. Nonshrink Nonmetallic Grout: ASTM C 1107.
3. Interior Anchoring Cement: Hydraulic expansion cement.
4. Exterior/Interior Anchoring Cement: Erosion-resistant hydraulic expansion cement.
5. Shop Primer: Fast curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79, compatible with topcoats.
6. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
7. Galvanizing Repair Paint: SSPC - Paint 20.
8. Bituminous Paint: Asphalt mastic, SSPC - Paint 12.

PART 3 EXECUTION

3.1 INSTALLATION

A. Take field measurements prior to preparation of shop drawings and fabrication. Do not delay job; allow for cutting and fitting if field measurement not practical.

B. Form work true to line with sharp angles and edges. Weld continuously, grind flush and make smooth on exposed surfaces.

C. Install work plumb and level with hairline joints and ground flush welds.

D. Lintels: Provide sizes indicated with 8" bearing at each end.

E. Touch-up damaged coatings with shop primer and galvanize repair paint.

F. Paint items scheduled in accordance with painting section.

END OF SECTION 05 500

SECTION 05 580 - FORMED METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Provide formed sheet metal window sill fabrications

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

C. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Formed Metal Fabrication Applications:
1. Application: Window Sills.

B. Sheet Metals:
1. Aluminum Sheet: ASTM B 209, alloy 5005 H15.

C. Auxiliary Materials:
1. Fasteners, Anchors, and Inserts: Noncorrosive.
2. Gaskets: Flexible cellular neoprene, ASTM D 1056.
3. Bituminous Paint: Asphalt mastic, SSPC - Paint 12.

D. Finishes:
1. Aluminum: Dark bronze anodized to match window framing.

PART 3 EXECUTION

3.1 INSTALLATION

A. Take field measurements prior to fabrication, where possible. Form to required shapes and sizes with true, straight edges, lines and angles. Provide light-tight, hairline joints.

B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction.

Coordinate with work of other sections.

C. Coordinate with work of other sections; provide inserts and templates as needed. Install work plumb and level with uniform appearance.

D. Restore damaged finishes and protect work.

END OF SECTION 05 580

SECTION 06 100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Related sections:
1. Section 06200: Finish Carpentry.
2. Section 09260: Gypsum Board Assemblies.
3. Section 09910: Paints.

1.2 REFERENCES

A. Standards of the following as referenced:
1. American National Standards Institute (ANSI).
2. American Society for Testing and Materials (ASTM).
3. Federal Specifications (FS).
4. Underwriters' Laboratories, Inc. (UL).

B. Industry standards:
1. Grading rules and standards:
a. American Lumber Standards Committee (ALSC).
b. APA - Engineered Wood Association (APA)
c. *APA Design/Construction Guide Residential & Commercial*, 1994 edition.
d. *APA Product Guide Grades and Specifications*, 1995 edition.
e. National Forest Products Association (NFPA).
f. Southern Forest Products Association (SFPA).
g. Southern Pine Inspection Bureau (SPIB):
h. *Standard Grading Rules for Southern Pine Lumber*, 1991 edition.
i. *Southern Pine Use Manual*, September 1991.
j. U.S. Department of Commerce Product Standards (PS)
k. PS-1-83; *Construction and Industrial Plywood.*
l. PS-20-70 (Reaffirmed 1981); *American Softwood Lumber Standard.*
m. West Coast Lumber Inspection Bureau (WCLIB).
n. Western Wood Products Association (WWPA)
o. *Western Grading Rules*, September 1991.
p. *Western Lumber Product Use Manual*, August 1991.
q. Preservative and fire retardant treated materials: American Wood-Preservers' Association (AWPA): *Book of Standards*.

1.3 SUBMITTALS

A. Quality control submittals:
1. Certificates:
a. Treating plant stating chemicals and process used, net amount of salts retained, and conformance with applicable standards for preservative treated wood.
b. UL, indicating compliance with specified requirements and governing ordinances for fire-retardant treatment.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Storage and protection:
1. Store materials minimum 6" above ground on blocking; cover with nonstaining waterproof breathable tarps; provide adequate air circulation and ventilation. Storing materials over two days

requires cover over ground under materials.
2. Storing seasoned materials in wet or damp portions of building is prohibited.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
1. Dimensions: Indicated lumber and sheet materials dimensions are nominal. Actual dimensions conform to industry standards referenced in this section or PS-20-70 (Reaffirmed 1981).
2. Framing lumber: Graded under ALSC rules adopted by SFPA or WWPA; S4S lumber, surfaced four sides, unless otherwise indicated.
3. Structural lumber:
a. SPIB graded: Use SPIB Empirical Design Values for Grade; No. 2 NonDense Grade, minimum.
b. WWPA graded: Use WWPA In-Grade Base Values for Species and Grade times Size Factor; No. 2 Grade, minimum.
4. Moisture content, lumber: KD19, except as otherwise indicated.
5. Furnish materials for construction activities under this section suitable for intent and purpose specified. Any species meeting code requirements acceptable, unless otherwise specified below.

B. Lumber:
2. Light framing, 2 to 4 nominal thickness, 2 to 6 nominal wide.
3. General framing: WWPA, STAND & BTR Grade; SPIB, STUD Grade.
4. Plates, blocking, bracing, and nailers: WWPA, STAND & BTR Grade; SPIB, STUD Grade.
5. General utility purposes: WWPA, STAND & BTR Grade; SPIB, STUD Grade.
6. Lumber for fire retardant or preservative treatment: SPIB No. 2 NonDense Grade, Southern Pine or WWPA No. 2 Grade, minimum.
7. Specific uses/grades not included above: Follow recommended grades for intended use defined in SPIB and WWPA standards in REFERENCES Article above.

C. Sheet materials;
1. Plywood: Conform to types and thicknesses recommended for intended usage by APA standards in REFERENCES Article above.

2. Gypsum sheathing board
   a. Georgia Pacific Corp.; Dens-Glass® Gold Firestop.
   b. Thickness: 5/8" thickness.
   c. Type: Rounded or square edge, moisture resistant board.
   d. Fasteners: ASTM C1002-88, Type S, or ASTM C954-86, 1" length minimum, bugle head.
   e. Joint protection materials:
   f. Caulk: Borden HPPG Elmer's Siliconized Acrylic Caulk.
   g. Tape: 2" wide 10X10 woven threads per inch self-adhering fiberglass joint tape.

D. Treated materials:
   1. Fire retardant treated materials:
      a. Lumber species and grades: Specified in Lumber Paragraph above.
      b. Plywood species and grades: Douglas Fir or Southern Pine plywood, APA grade for intended use indicated above.
   2. Treatment:
      a. Acceptable treatment: Hoover Treated Wood Products; Pyro-Guard.
      b. Fire retardant treatment: UL rated FR-S kiln dried using halogen, sulfate, monoammonium phosphate (MAP), and diammonium phosphate (DAP) free fire retardant chemicals.
      c. Lumber: AWPA C-20-91.
      d. Plywood: AWPA C-27-91.

E. Moisture content after treatment and final drying, indicated in stamp as "KDAT":
   1. Lumber: 19%, maximum.
   2. Plywood: 15%, maximum.

F. ASTM E84-87 requirements as follows:
   1. 30 minute test, minimum.
   2. Flamespread: Less than 25 after 30 minute test period.

G. Preservative treated materials:
   1. Lumber: AWPA C-2-92, 0.25 lbs. retention, for above grade use; 0.40 lbs. retention, for at or below grade use.
   2. Plywood: AWPA C-9-92, 0.25 lbs. retention, for above grade use; 0.40 lbs. retention, for at or below grade use.
   3. Moisture content after treatment and final drying:
      a. Lumber: 19%, maximum.
      b. Plywood: 15%, maximum.

H. Locations:
   1. Fire retardant treatment: Indicated or required by code.
   2. Preservative treatment:
      a. Sills, sleepers, blocking, furring, stripping, or similar concealed members in contact with concrete or masonry.
      b. Cants, nailers, curbs, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, or waterproofing.
      c. Other locations indicated or required by code.

I. Hardware:
1. Nails, bolts, nuts, washers, screws, expansion bolts, clips, power actuated fasteners, and hardware necessary for installation of indicated materials. Hardware to adequately resist design loads and meet codes. Hardware types to secure materials to substrates encountered.
2. Anchors and fasteners for securing wood items, unless noted otherwise as follows:
   a. Bolts, nuts, studs, and lag screws: ANSI Standards B18.2.1-81, B18.5.2-81, and B18.5.2.2M-82 and FS FF-B-588-Rev D.
   b. Wood screws: ANSI B18.6.1-81 and FS FF-S-325-Int Am. 3; style and material best suited for use.
   c. Nails, brads, staples, and spikes: FS FF-N-105-Rev B (Valid Notice 1); type and size best suited for use.
   d. Nails and spikes for exterior exposed-to-view and other exterior framing: ASTM A153-82, Class D, hot dip galvanize.

J. Auxiliary Materials:
1. Building Wrap: Air-retarder sheeting made from polyolefins; cross-laminated films, woven strands, or spun-bonded fibers; coated or uncoated; with or without perforations; ASTM E 1677, Type I.
2. Sill Sealer Gaskets: Glass fiber strip resilient insulation.
3. Framing Anchors and Fasteners: Non-corrosive, suitable for load and exposure. Drywall screws are not acceptable.

2.1 SOURCE QUALITY CONTROL

A. Inspection:
1. Grade marks:
a. General: Identify lumber and plywood by official grade mark of agency approved by ALSC Board of Review.
2. Lumber grading:
a. Grade stamp to contain symbol of grading agency, mill number or name, grade of lumber, species or species grouping, or combination designation, rules under which graded, where applicable, and condition of seasoning at time of manufacture.
b. Conform to PS 20-70 (Reaffirmed 1981) with amendments, for grading of species used. Current edition of applicable association grading rules govern. All lumber 2" or less in thickness shall bear grade mark of an ALSC Board of Review approved agency.

d. Softwood plywood; appropriate grade trademark of APA, indicate:

e. Type, grade, class, and identification index.
f. Inspection and testing agency mark.

B. Treated lumber and plywood: Identify each piece with appropriate UL stamp indicating compliance with indicated requirements; verify stamp contains treatment name, manufacturer, and location; third party inspection agency; specie; flamespread; and AWPA classification.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Accurately cut and fit items with close joints, to plane and alignment.
2. Rigidly secure members, free of warp or wind to maintain alignment and to resist design loads.
3. Form linear runs of materials using lengths as great as practicable.
4. Offset joints in members not less than three feet where multiple members are used to form linear runs.

B. Brush apply preservative treatment to cut ends and borings of treated lumber; use copper naphthenate having 2% metallic solution in accord with AWPA Standard M4.

C. Temporary supports:
1. Make wood centering or other necessary supports for openings in masonry walls accurate and strong. Brace and secure in position until masonry has thoroughly set.
2. Install blocking indicated and required. Secure blocking firmly with anchors at not more than 2'-0" O.C.

D. Blocking:
1. Wedge, align, and anchor blocking with nails to wood construction; screws to steel construction.
2. Coordinate blocking with locations of finishing materials, fixtures, specialty items, and trim.

E. Sheet material installation:
1. Plywood:
a. Install with face grain perpendicular to supports; terminate panels over supports; stagger end joints of adjacent panels.
b. Allow 1/16" between end joints and 1/8" between edge joints for expansion and contraction.
c. Metal framing: Attach plywood with APA recommended fasteners; space at 6" O.C. along each support; 12" O.C. intermediate, unless otherwise indicated in writing by APA; follow more stringent requirements.
2. Interior plywood: Install over interior studs in full height sheets with tight butted joints. Sand joints to obtain joints without offsets.
3. Gypsum sheathing:
a. Install in accord with GA-253-88 and sheathing manufacturer's installation instructions; follow more stringent requirements. Typically use screw type fasteners unless specifically prohibited by local code.
b. Apply self-adhering fiberglass tape to joints; overlap intersections tape full tape width. Apply 3/8" continuous caulk bead at joint. Embed caulk into entire tape surface with trowel; apply enough caulk to exposed fasteners to cover completely when troweled smooth.

END OF SECTION 06 100

SECTION 06 150 - WOOD DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Solid-sawn floor decking.

B. Related Sections include the following:
1. Division 6 Section "Rough Carpentry" for dimension lumber items associated with wood decking.

1.3 SUBMITTALS

A. Product Data:
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treatment plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

a. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before further fabrication or shipment to Project site.

2. For sealant and installation adhesive.

1.4 QUALITY ASSURANCE

A. Standard for Solid-Sawn Wood Decking: Comply with AITC 112, "Standard for Tongue-and-Groove Heavy Timber Roof Decking."

B. Forest Certification: Provide wood decking produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Schedule delivery of wood decking to avoid extended on-site storage and to avoid delaying the Work.

B. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings. Stack wood decking with surfaces that are to be exposed in the final work protected from exposure to sunlight.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. General: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

B. Grade Stamps: Provide solid-sawn wood decking with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, species, grade, moisture content at time of surfacing, and mill. Apply grade stamp to surfaces that will not be exposed to view.

C. Moisture Content: Provide wood decking with 15 percent maximum moisture content at time of dressing.

D. Preservative Treatment: Pressure treat solid-sawn wood decking according to AWPA C31 with inorganic boron (SBX) and redry wood to 15 percent maximum moisture content.

1. Use oxine copper (copper-8-quinolinolate) in a light petroleum solvent.
2. Use preservative solution without water repellents or substances that might interfere with application of indicated finishes.

2.2 SOLID-SAWN WOOD DECKING

A. Decking Species: Douglas fir-larch or Douglas fir-larch (North).

B. Decking Nominal Size: 2x6.

C. Decking Grade: Select(ed) Decking.

D. Decking Grade: Dense Standard Decking.

E. Face Surface: Smooth.

F. Edge Pattern: Channel grooved.

2.3 FASTENERS AND ACCESSORY MATERIALS

A. Fasteners for Solid-Sawn Decking: Provide fastener size and type complying with decking standard for thickness of deck used.

B. Fastener Material: Hot-dip galvanized steel.

C. Sealant: Elastomeric joint sealant complying with requirements in Division 7 Section "Joint Sealants" for Use NT (nontraffic) and for Uses M, G, A, and, as applicable to joint substrates indicated, O joint substrates.

D. Penetrating Sealer: Clear sanding sealer complying with Division 9 painting Sections and compatible with topcoats specified for use over it.

2.4 FABRICATION

A. Shop Fabrication: Where preservative-treated decking is indicated, complete cutting, trimming, surfacing, and sanding before treating.

B. Fabricate decking in lengths for controlled random lay-up.

C. Seal Coat: After fabricating and surfacing decking, apply a saturation coat of penetrating sealer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and support framing in areas to receive wood decking for compliance with installation tolerances and other conditions affecting performance of wood decking.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install solid-sawn wood decking to comply with referenced standard and with end joints located according to lay-up indicated.

a. Use 6d nails for 2x6 and 2x8 decking.

B. Where preservative-treated decking must be cut during erection, apply a field-treatment preservative to comply with AWPA M4.

1. Use inorganic boron (SBX) treatment.

C. Apply joint sealant to seal roof decking at exterior walls at the following locations:

1. Between decking and supports located at exterior walls.

2. Between decking and exterior walls that butt against underside of decking.
3. Between tongues and grooves of decking over exterior walls and supports at exterior walls.

3.3 ADJUSTING

A. Repair damaged surfaces and finishes after completing erection. Replace damaged decking if repairs are not approved by Architect.

3.4 PROTECTION

A. Provide temporary waterproof covering to protect exposed decking before applying roofing.

END OF SECTION 06 150

SECTION 06 160 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Wall sheathing.
2. Ceiling and Soffit sheathing.
3. Building paper.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for plywood backing panels.

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. For building wrap, include data on air-/moisture-infiltration protection based on testing according to referenced standards.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.

1. Product: Subject to compliance with requirements, provide "Dens-Glass Gold" by G-P Gypsum Corporation.
2. Type and Thickness: Regular, 1/2 inch (13 mm) thick.
3. Size: 48 by 96 inches (1219 by 2438 mm) or 48 by 120 inches (1219 by 3048 mm) for vertical installation.

2.2 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, attach sheathing to comply with ASTM C 954.

2.3 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sheathing Tape for Glass-Mat Gypsum Sheathing Board: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing board and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. GA-253 and ASTM C 1280.

D. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to wood framing with screws.
2. Fasten gypsum sheathing to cold-formed metal framing with screws.
3. Install boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
4. Install boards with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.
1. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

C. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.
2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

3.3 SHEATHING JOINT-AND-PENETRATION TREATMENT

A. Seal sheathing joints according to sheathing manufacturer's written instructions.
1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints, and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.4 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturers written instructions.

1. Prime substrates as recommended by flashing manufacturer.
2. Lap seams and junctures with other materials at least 4 inches (100 mm), except that at flashing flanges of other construction, laps need not exceed flange width.
3. Lap flashing over weather-resistant building paper at bottom and sides of openings.
4. Lap weather-resistant building paper over flashing at heads of openings.
5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

3.5 PROTECTION

A. Paper-Surfaced Gypsum Sheathing: Protect sheathing by covering exposed exterior surface of sheathing with weather-resistant sheathing paper securely fastened to framing. Apply covering immediately after sheathing is installed.

END OF SECTION 06 160

SECTION 06 171 - WOOD TRUSSES

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes supplying and erection of Pre-Fabricated Wood Trusses.

1.02 RELATED SECTIONS

A. Section 06100 Rough Carpentry

1.03 QUALITY ASSURANCE

A. Furnish materials complying with the following:

1. Lumber.
   a. Graded in accordance with the latest edition of "Standard Grading Rules, No. 17," WCLIB, or " Western Lumber Grading Rules," WWPA. Furnish lumber bearing a recognized grading bureau mark or a "Certificate of Grade." Where a grade for Douglas Fir (DF) species is indicated, other species, if approved by the Architect/Engineer, may be supplied on an equal stress grade basis.
2. Plywood.
   a. Plywood plates may be used in lieu of metal plates with the approval of the Architect/Engineer. Graded in accordance with the latest edition of APA PS 1-95. Furnish panels indentifiable by a grade trademark of a recognized grading association. Index numbers (i.e. 24/0) may be larger but not smaller than shown.

1.04 PROJECT CONDITIONS

A. The site has a snow load of ___ psf.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Lumber grades specified below are taken from "Dressing and Grading Rules No. 16 Standard Grading Rules, No. 17." Equal grades from "Western Lumber Grading Rules" are acceptable.

1. Top Chord.
   a. S4S No. 1, DF, S-dry.
2. Bottom Chord.
   a. S4S No. 2, DF, S-dry.
3. Web Members.
   a. S4S No. 2, DF, S-dry
4. Gussets.
   a. 1/2 inch Structure I, C-C plywood.

5. Adhesive.
   a. ASTM D4689.

B. Metal Plates.

1. Use patented metal plates in truss fabrication. Size plates to support a snow load of ___ lbs./ft.^{2} over the entire roof plus a bottom chord load of 15 lbs. ft.^{2}
2. Plates shall conform to Uniform Building Code (UBC).

PART 3 - EXECUTION

3.01 TRUSS FABRICATION

A. Fabrication trusses in a jig set on a level surface. Cut all members to provide full bearing at all joints. Arrange members so that grade stamps will not be visible in the finished building. Glue and nail all joints with 6d common nails spaced 4 inch on center in 2 rows. Drive nails so that heads are buried in plywood.

B. Apply adhesive only where the temperature in the entire work area is controlled at 50 degrees F or above. Maintain trusses at 50 degrees F or above for a minimum of 24 hours before transporting or erecting.

3.02 ERECTION

A. Protect trusses from rain, except during erection when trusses may be exposed for 2 days maximum.

B. Nail trusses to top plate with three 16d nails.

END OF SECTION 06 171

SECTION 06 185 - STRUCTURAL GLUED-LAMINATED TIMBER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes framing using structural glued-laminated timbers.

B. Related Sections include the following:
1. Division 6 Section "Rough Carpentry" for dimension lumber items associated with structural glued-laminated timber construction.
2. Division 6 Section "Wood Decking" for wood roof decking.

1.3 DEFINITIONS

A. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected and prepared wood laminations bonded together with adhesives and with the grain of the laminations approximately parallel longitudinally.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide structural glued-laminated timber, including connectors, capable of withstanding structural loads shown on Drawings without exceeding allowable design working stresses listed in AITC 117--DESIGN or determined according to ASTM D 3737 and acceptable to authorities having jurisdiction.

B. Seismic Performance: Provide structural glued-laminated timber, including connectors, capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

1. Seismic Design Criteria:
   a. Seismic Use Group – 1
   b. Seismic Site Class – D
   c. Seismic Design Category – C
   d. Seismic Importance Factor 1e = 1.0
   e. Spectral Response Acceleration Coefficient, Sd5=o.260, Sd1=0.170
   f. Response Modification Factor – R = 2.0

1.5 SUBMITTALS

A. Product Data: For structural glued-laminated timber and connectors.

1. Include data on lumber, adhesives, fabrication, and protection.
2. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treatment plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated materials.
3. Include installation instructions for timber connectors.

B. Shop Drawings: Show layout of structural glued-laminated timber system and full dimensions of each member. Indicate species and laminating combination, adhesive type, and other variables in required work.

1. Include large-scale details of connections.
2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples: Full width and depth, 24 inches (600 mm) long, showing the range of variation to be expected in appearance of structural glued-laminated timber, including variations due to specified treatment].

1. Apply specified factory finish to three sides of half-length of each Sample.

D. Certificates of Conformance: Issued by a qualified testing and inspecting agency indicating that structural glued-laminated timber complies with requirements in AITC A190.1.

E. Qualification Data: For manufacturer.

F. Research/Evaluation Reports: For structural glued-laminated timber and connectors.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide factory-glued structural units produced by an AITC- or APA-licensed firm.

1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA trademark. Place mark on surfaces that will not be exposed in the completed Work.

B. Quality Standard: Comply with AITC A190.1, "Structural Glued Laminated Timber."

C. Forest Certification: Provide structural glued-laminated timber produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with provisions in AITC 111, "Recommended Practice for Protection of Structural Glued Laminated Timber during Transit, Storage, and Erection."

B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

PART 2 - PRODUCTS

2.1 STRUCTURAL GLUED-LAMINATED TIMBER

A. General: Provide structural glued-laminated timber that complies with AITC 117--MANUFACTURING or research/evaluation reports acceptable to authorities having jurisdiction.

1. Provide structural glued-laminated timber made from a single species.

B. Species and Grades for Structural Glued-Laminated Timber: Provide structural glued-laminated timber made from Douglas fir-larch in grades needed to comply with Part 1 "Performance Requirements" Article.

C. Species and Grades for Beams: Provide structural glued-laminated timber that complies with AITC 117--MANUFACTURING or research/evaluation reports acceptable to authorities having jurisdiction and the following:

1. Species and Beam Stress Classification: Douglas fir-larch, 24F-1.8E.
2. Lay-up: Balanced.

D. Appearance Grade: Architectural appearance grade, complying with AITC 110.

E. Preservative Treatment: Where preservative-treated structural glued-laminated timber is indicated, pressure treat after fabrication according to AWPA C28.

1. Use oxine copper (copper-8-quinolinolate) in a light petroleum solvent.
2. Use preservative solution without water repellents or substances that might interfere with application of indicated finishes.

F. Preservative Treatment: Where preservative-treated structural glued-laminated timber is indicated, pressure treat lumber before gluing according to AWPA C28.

1. Use oxine copper (copper-8-quinolinolate) in a light petroleum solvent.
2. Use preservative solution without water repellents or substances that might interfere with application of indicated finishes.
3. After dressing and fabricating members, apply a field-treatment preservative to comply with AWPA M4 to surfaces cut to a depth of more than 1/16 inch (1.5 mm).

a. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.

G. Adhesive: Wet-use type complying with ASTM D 2559.

H. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

I. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

2.2 TIMBER CONNECTORS

A. General: Unless otherwise indicated, fabricate from the following materials:

1. Structural-steel shapes, plates, and flat bars complying with ASTM A 36/A 36M.
2. Round steel bars complying with ASTM A 575, Grade M 1020.
3. Hot-rolled steel sheet complying with ASTM A 1011/A 1011M, Structural Steel, Type SS, Grade 33.
4. Stainless-steel plate and flat bars complying with ASTM A 666, Type 304.
5. Stainless-steel bars and shapes complying with ASTM A 276, Type 304.
6. Stainless-steel sheet complying with ASTM A 666, Type 304.

B. Fabricate beam seats from stainless steel with 3/8-inch (9.5-mm) bearing plates, 3/4-inch- (19-mm-) diameter-by-12-inch- (300-mm-) long deformed bar anchors, and 0.239-inch (6-mm) side plates.

C. Fabricate arch base shoes from stainless steel with 1-inch (25-mm) base plates and 3/8-inch (9.5-mm) side plates.

D. Fabricate beam hangers from steel stainless steel with 0.179-inch (4.6-mm) stirrups and 0.239-inch (6-mm) top plates.

E. Fabricate hinge connectors from stainless steel with 0.179-inch (4.6-mm) side plates and 3/4-inch (19-mm) top and bottom plates.

F. Fabricate strap ties from stainless steel, 3 inches (75 mm) wide by 0.239 inch (6 mm) thick.

G. Fabricate tie rods from round steel bars with upset threads connected with forged-steel turnbuckles complying with ASTM A 668/A 668M.

H. Provide bolts, 3/4 inch (19 mm), unless otherwise indicated, complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); nuts complying with ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

I. Provide shear plates, 4 inches (102 mm) in diameter, complying with ASTM D 5933.

J. Finish steel assemblies and fasteners with rust-inhibitive primer, 2-mil (0.05-mm) dry film thickness.

K. Hot-dip galvanize steel assemblies and fasteners after fabrication to comply with ASTM A 123/A 123M or ASTM A 153/A 153M.

2.3 FABRICATION

A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.

1. Dress exposed surfaces to remove planing or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.

B. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.

C. End-Cut Sealing: Immediately after end-cutting each member to final length and after preservative treatment, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood-coated for not less than 10 minutes.

D. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit, except for preservative-treated wood where treatment included a water repellent.

2.4 FACTORY FINISHING

A. Clear Finish: Manufacturer's standard, two-coat, clear conversion varnish finish; oven dried and resistant to mildew and fungus.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of structural glued-laminated timber.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Erect structural glued-laminated timber true and plumb, with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.

1. Lift with padded slings and protect corners with wood blocking.
2. Install structural glued-laminated timber to comply with Shop Drawings.
3. Install timber connectors as indicated.

B. Framing Built into Masonry: Provide 1/2-inch (13-mm) clearance at tops, sides, and ends of members built into masonry; bevel cut ends 3 inches (76 mm); and do not embed more than 4 inches (102 mm), unless otherwise indicated.

C. Fit structural glued-laminated timber by cutting and restoring exposed surfaces to match specified surfacing and finishing.

1. Predrill for fasteners using timber connectors as templates.
2. Dress exposed surfaces to remove planing or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
3. Coat crosscuts with end sealer.

4. Where preservative-treated members must be cut during erection, apply a field-treatment preservative to comply with AWPA M4.

    a. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.

D. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.

1. Where preservative-treated members must be cut during erection, apply a field-treatment preservative to comply with AWPA M4.

    a. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.

3.3 ADJUSTING

A. Repair damaged surfaces and finishes after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by Architect.

3.4 PROTECTION

A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose including protection from weather, sunlight, soiling, and damage from work of other trades.

1. Coordinate wrapping removal with finishing work specified in Division 9. Retain wrapping where it can serve as a painting shield.

END OF SECTION 06 185

SECTION 06 402 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Laminate-clad cabinets (plastic-covered casework).
2. Shop finishing of woodwork.

1.3 DEFINITIONS

A. Interior Architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction prior to woodwork installation.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcing specified in other Sections.
3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in Architectural woodwork.
4. Apply WIC Certified Compliance Label to first page of shop drawings.

C. Samples for initial selection of the following in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.

1. Shop-applied transparent finishes.
2. Thermoset decorative overlays.
3. Exposed cabinet hardware, one unit for each type and finish.

D. Samples for verification of the following:

1. Laminate-clad panel products, 8 by 10 inches, for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
2. Thermoset decorative-overlay surfaced panel products, 8 by 10 inches, for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
3. Corner pieces as follows:

    a. Cabinet front frame joints between stiles and rail, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
    b. Miter joints for standing trim.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing Architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units without delaying the Work.

B. Single-Source Responsibility for Fabrication and Installation: Engage a qualified woodworking firm to assume undivided responsibility for fabricating, finishing, and installing woodwork specified in this Section.

C. Quality Standard: Except as otherwise indicated, comply with the following standard:

1. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grades of interior Architectural woodwork, construction, finishes, and other requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

B. Do not deliver woodwork until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Environmental Limitations: Obtain and comply with woodwork fabricator's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork will be within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

C. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and

show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior Architectural woodwork can be supported and installed as indicated.

B. Hardware Coordination: Distribute copies of approved schedule for cabinet hardware specified in Division 8 Section "Door Hardware" to fabricator of Architectural woodwork; coordinate cabinet shop drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:

1. Softwood Plywood: PS 1.
2. Hardwood Plywood and Face Veneers: HPVA HP-1.

B. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated in the Work include, but are not limited to, the following:

a. Formica Corporation.
b. Nevamar Corp.
c. Westinghouse Electric Corp.; Specialty Products Div.
d. Ralph Wilson Plastics Co.

C. Adhesive for Bonding Plastic Laminate: Contact cement.

D. Thermoset Decorative Overlay: Decorative surface of thermally fused polyester or melamine-impregnated web, bonded to specified substrate and complying with ALA 1992.

1. Substrate: Plywood

2.2 CABINET HARDWARE AND ACCESSORY MATERIALS

A. Cabinet Hardware Schedule: Refer to drawings and/or schedule in Division 8, Section , Door Hardware.

B. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of BHMA A156.9, unless otherwise noted.

2.3 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements.

1. For metal framing supports, provide screws as recommended by metal-framing manufacturer.

C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.

2.4 FABRICATION, GENERAL

A. Interior Woodwork Grade: Provide interior woodwork complying with the referenced quality standard and of the following grade:

1. Grade: Premium.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of cabinets and edges of solid-wood (lumber) members 3/4 inch thick or less: 1/16 inch.

D. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Trial fit assemblies at the fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on approved shop drawings before disassembling for shipment.

E. Shop-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.

F. Semiexposed Surfaces: Provide surface materials indicated below:

1. Thermoset decorative overlay.

2.5 LAMINATE-CLAD CABINETS (PLASTIC-COVERED CASEWORK)

A. Quality Standard: Comply with AWI Section 400 requirements for laminate-clad cabinets.

1. Grade: Premium.

B. AWI Type of Cabinet Construction: SEE DRAWINGS ;Provide flush overlay ,unless shown otherwise.

C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other than Tops: GP-50, 0.050-inch nominal thickness.
2. Vertical Surfaces: GP-28, 0.028-inch nominal thickness.
3. Edges: GP-50, 0.050-inch nominal thickness.

D. Materials for Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other than Drawer Bodies: Thermoset decorative overlay.

E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Provide Design Builder's selections from laminate manufacturer's full range of colors and finishes in the following categories:

2.6 SHOP FINISHING OF INTERIOR ARCHITECTURAL WOODWORK

A. General: The entire finish of interior Architectural woodwork is specified in this Section.

B. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing Design Builder woodwork, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer, to backs of trim, cabinets, and the underside of countertops.

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches

C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

E. Cabinets: Install without distortion so that doors and drawers fit openings properly and are 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.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.

F. Tops: Anchor securely to base units and other support systems as indicated. Calk space between backsplash and wall with specified sealant.

1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 402

SECTION 07 130 - SHEET MEMBRANE WATERPROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparations.

B. Application of self-adhering, sheet membrane waterproofing.

C. Protection board.

1.2 RELATED SECTIONS

A. Section 04100 – Brick Unit Masonry

B. Section 04220 – Concrete Unit Masonry

C. Section 03300 – Cast In Place Concrete

1.3 REFERENCES

A. ASTM(American Society for testing and Materials)

1. C 836
2. D 412
3. D570
4. D 5385

1.4 SUBMITTALS FOR REVIEW

A. Product Data: Provide product criteria, characteristics, accessories, jointing and

1.5 QUALITY ASSURANCE

A. Manufacturer: Sheet membrane waterproofing systems shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of self-adhesive sheet membrane waterproofing. Manufacturer's proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past 5 years.

B. Installer: Company specializing in performing the work of this section with minimum 3 years experience.

C. Materials: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.

B. Store protection board flat and off the ground. Provide over on top and all sides.

1.7 PROJECT CONDITIONS

A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.

B. Proceed with installation only when substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.

1.8 WARRANTY

A. Provide five-year manufacturer warranty for waterproofing failing to resist penetration of water.

B. For warranty repair work, remove and replace materials concealing waterproofing.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Grace Construction Products Biththene 3000/Low Temperature Membrane used as standard of quality.

B. Other Acceptable Manufacturers:
1. W. R. Meadows-Sealtight Mel-Rol
2. Nervastral, Inc.- Bitu-Mem

2.2 MATERIALS

A. Sheet Membrane: Self-adhesive, cold-applied composite sheet consisting of a thickness of 1.4 mm of rubberized asphalt and 0.1 mm (0.004 in.) of cross-laminated, high-density polyethylene film. Provide rubberized asphalt membrane covered with a release sheet which is removed during installation. No special adhesive or heat shall be required to form laps.

B. Protection Board: Expanded Polystyrene Protection board: 25 mm (1 in.). Adhere to waterproofing membrane with manufacturer's recommended adhesive.

C. Miscellaneous Materials: Primer, mastic, liquid membrane, tape and accessories specified or acceptable to manufacturer of sheet membrane waterproofing

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate surfaces are smooth and durable; free of matter detrimental to application of waterproofing system.

B. Verify items which penetrate surfaces to receive waterproofing are securely installed.

3.2 PREPARATION

A. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.

B. Remove concrete fins, projections, and form ties.

C. Apply waterproofing over concrete block and brick with smooth trowel-cut mortar joints or parge coat.

D. Seal construction joints through wall projections and penetrations with joint seal.

3.3 INSTALLATION- SHEET MEMBRANE WATERPROOFING

A. Refer to manufacturer’s literature for recommendations on installation, including but not limited to the following:

1. Apply primer at the rate recommended by manufacturer. Recoat areas not waterproofed if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of primer.
2. Delay application of membrane until primer is completely dry. Dry time will vary with weather conditions.
3. Seal daily terminations with troweled bead of mastic.
4. Apply protection board and related materials in accordance with manufacturer’s recommendations.

3.4 PROTECTION OF FINISHED WORK

A. Remove any masking materials after installation. Clean any stains on materials which would be exposed in the completed work.

B. Protect completed membrane waterproofing from subsequent construction activities as recommended by manufacturer.

END OF SECTION 07 130

SECTION 07 160 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Cold-applied, cut-back asphalt dampproofing.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product specified, including data substantiating that materials comply with requirements for each dampproofing material specified. Include recommended method of application, recommended primer, number of coats, coverage or thickness, and recommended protection course.

1. Certification by dampproofing manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

1.4 PROJECT CONDITIONS

A. Substrate: Proceed with dampproofing only after substrate construction and penetrating work have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Cold-Applied, Cut-Back Asphalt Dampproofing:

a. ChemRex, Inc.; Sonneborn Building Products Div.
b. Karnak Chemical Corporation.
c. Meadows: W.R. Meadows, Inc.

2.2 BITUMINOUS DAMPPROOFING

A. General: Provide products recommended by manufacturer for designated application.

1. Odor Elimination: For interior and concealed-in-wall uses, provide type of bituminous dampproofing material warranted by manufacturer to be substantially odor free after drying for 24 hours under normal conditions.

B. Cold-Applied, Cut-Back Asphalt Dampproofing: Asphalt and solvent compound mixed to a smooth, uniform consistency to provide a firm, moisture-resistant, vapor-resistant, elastic coating recommended by the manufacturer for dampproofing use when applied according to the manufacturer's instructions.

1. Spray Grade: Asphalt roof coating, consisting of an asphalt base with petroleum solvents and no mineral fibers, complying with ASTM D 4479, Type I.

2.3 MISCELLANEOUS MATERIALS

A. Primer: Asphalt primer complying with ASTM D 41, for asphalt-based dampproofing.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturer.

B. Fill voids, seal joints, and apply bond breakers, if any, as recommended by prime materials manufacturer, with particular attention at construction joints.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's recommendations except where more stringent requirements are indicated and where Project conditions require extra precautions to ensure satisfactory performance of work.

B. Application: Apply dampproofing to the following surfaces.

1. Exterior surface of inside wythe of double-wythe, exterior masonry walls above grade, to prevent water-vapor penetration through the wall.
2. Where indicated on the Drawings.

C. Cold-Applied Asphalt Dampproofing: For exterior surfaces, provide either emulsified or cut-back, asphalt dampproofing materials, at Contractor's option. For interior surfaces, provide only emulsified asphalt materials.

3.3 COLD-APPLIED, CUT-BACK ASPHALT DAMPPROOFING

A. Spray Grade: Brush or spray apply a coat of dampproofing at a rate of 1.25 to 2 gal./100 sq. ft., depending on substrate texture, to produce a uniform, dry-film thickness of not less than 12 mils.

B. Apply a second coat, as specified above, after allowing 24 hours for first coat to dry. Apply second coat at a rate of 0.8 to 1.25 gal./100 sq. ft. Apply double thickness of second coat where first application has failed to produce a smooth, shiny, impervious coat.

END OF SECTION 07 160

SECTION 07 180 - WATER REPELLENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes clear water-repellent coatings for the following vertical and nontraffic horizontal surfaces:

1. Brick Unit Masonry.
2. Stone

B. Related Sections include the following:

1. Division 4 Sections for concrete unit masonry, stone, and masonry and stone restoration and cleaning.

1.3 PERFORMANCE REQUIREMENTS

A. Provide water repellents with the following properties based on testing manufacturer's standard products, according to test methods indicated, applied to substrates simulating Project conditions using same materials and application methods to be used for Project.

1. Absorption: Minimum 90 percent reduction of absorption after 24 hours in comparison of treated and untreated specimens.

a. Concrete Unit Masonry .

2. Water-Vapor Transmission: Maximum 10 percent reduction in rate of vapor transmission in comparison of treated and untreated specimens, per ASTM E 96.
3. Water Penetration and Leakage through Masonry: Maximum 90 percent reduction in leakage rate in comparison of treated and untreated specimens, per ASTM E 514.
4. Durability: Maximum 5 percent loss of water repellency after 2500 hours of weathering in comparison to specimens before weathering, per ASTM G 53.
5. Permeability: Minimum 80 percent breathable in comparison of treated and untreated specimens, per ASTM D 1653.
6. Chloride-Ion Intrusion in Concrete: Transportation Research Board, National Research Council's NCHRP Report 244, Series II tests.

a. Reduction of Water Absorption: 80 percent.
b. Reduction in Chloride Content: 80 percent.

1.4 SUBMITTALS

A. Product Data: Include manufacturer's specifications, surface preparation and application instructions, recommendations for water repellents for each surface to be treated, and protection and cleaning instructions. Include data substantiating that materials are recommended by manufacturer for applications indicated and comply with requirements.

B. Certification by water repellent manufacturer that products supplied comply with local regulations controlling use of VOCs.

1.5 QUALITY ASSURANCE

A. Field Samples: Design Builder will select one representative surface for each substrate to receive water repellents. Apply water repellent to each substrate, with either partial or full coverage as directed. Comply with application requirements of this Section.

1. Obtain Design Builder's approval of field samples before applying water repellents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
1. Silanes: With more than 3.3 lb/gal. (400 g/L) VOCs.

a. Sil-Act ATS 22; Advanced Chemical Technologies, Inc.
b. A-H Aridox 20; Anti Hydro International, Inc.
c. Dur A Pell 20; Chemprobe Technologies, Inc.
d. Hydrozo 20-V; Harris Specialty Chemicals, Inc.
e. Klereseal 940-S; Pecora Corporation.
ae. S-5 Silane 20 Percent; Specco Industries, Inc.

2. Silane/Siloxane Blends: With more than 3.3 lb/gal. (400 g/L) VOCs. Option: As approved by Design Builder based on field sample/test.

a. Rainstop; Conspec Marketing & Manufacturing Co., Inc.
b. Diedrich 303; Diedrich Technologies, Inc.
c. Hydropel; L&M Construction Chemicals, Inc.
d. Hydropel 16; L&M Construction Chemicals, Inc.
e. Hydropel HD; L&M Construction Chemicals, Inc.

2.2 WATER REPELLENTS

A. Silanes, 20 Percent Solids: Penetrating water repellent. A monomeric compound containing approximately 20 percent alkyltrialkoxysilanes with alcohol, mineral spirits, water, or other proprietary solvent carrier.
B. Silane/Siloxane Blends: Consisting of silanes and siloxanes blended to achieve a particular penetration and protection on a specific substrate.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrate of substances that might interfere with penetration or performance of water repellents. Test for moisture content, according to repellent manufacturer's written instructions, to ensure surface is sufficiently dry.

1. Concrete Unit Masonry: Clean concrete unit masonry per ASTM Standard

B. Test for pH level, according to water repellent manufacturer's written instructions, to ensure chemical bond to silicate minerals.

C. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live plants and grass.

D. Coordination with Sealants: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.

E. Test Application: Before performing water-repellent work, including bulk purchase and delivery of products, prepare a small application in an unobtrusive location and in a manner approved by Design Builder to demonstrate the final effect (visual, physical, and chemical) of planned application. Proceed with work only after Design Builder approves test application or as otherwise directed.

3.2 APPLICATION

A. Apply a heavy-saturation spray coating of water repellent on surfaces indicated for treatment using low-pressure spray equipment. Comply with manufacturer's written instructions for using airless spraying procedure, unless otherwise indicated.

B. Apply a second saturation spray coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

3.3 CLEANING

A. Protective Coverings: Remove protective coverings from adjacent surfaces and other protected areas.

B. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Repair damage caused by water-repellent application. Comply with manufacturer's written cleaning instructions.

END OF SECTION 07 180

SECTION 07 190 - VAPOR RETARDER

PART 1GENERAL

1.1 SUMMARY

A. Work of this section includes vapor retarder material for building concrete slab.

1.2 SUBMITTALS:

A. Product data: Submit manufacturer's product literature and instructions for vapor retarder material and mastic.

B. Samples: Submit 1'-0" by 1'-0" samples of vapor retarder.

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original containers with labels intact.

B. Store materials out of the weather, in a single location. Protect from freezing.

PART 2 PRODUCTS

2.1 VAPOR RETARDER

A. Acceptable products:
1. Raven Industries, Rufco Super Sampson 400 SSB.
2. Reef Industries, Inc., Griff9olyn T-65.
3. Stego Industries, LLC, Stego Wrap Vapor Barrier

B. Characteristics:
1. Minimum 3-ply, high density polyethylene and nylon yarn laminate.
2. Perm rating: Less than 0.045 when tested in accord with ASTM E96-94, Procedure A.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install vapor retarder over compacted, clean subgrade material, free of debris and protrusions.

B. Lay vapor retarder over interior building area to receive concrete slab. Apply membrane in full sheet widths. Lay membrane with seams perpendicular to and lapped in direction of pour. Turn edges of membrane up to within ½" of top of slab at intersection with vertical surfaces.

C. Lap edges 6" and seal with mastic or tape over entire lap. Seal to penetrations and protrusions by turning membrane up a minimum of 6" and sealing membrane edges to penetrations and protrusions with mastic or tape. Fold at corners to form envelope.

D. Where expansion or control joints are indicated in slab, lay vapor retarder continuous under joint filler.

E. Protect vapor retarder installation from damage until concrete slab is in place.

END OF SECTION 07 190

SECTION 07 210 - BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Related sections:
1. Section 06100: Rough Carpentry.
2. Section 07840: Firestopping.
3. Section 07410: Manufactured Roof Panels.
4. Section 09260: Gypsum Board Assemblies.

1.2 REFERENCES

A. Standards of the following as referenced:
1. ASTM.
2. Underwriters' Laboratories, Inc. (UL).

1.3 SUBMITTALS

A. Product data:
1. Product data and installation instructions for each type insulation and installation.
2. *"Manufacturer's Safety Data Sheets"*, (M.S.D.S.), for materials.

B. Quality control submittals:
1. Certificates; indicate materials supplied or installed are:
2. Asbestos free.
3. CFC-12 free.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Batt insulation, fiberglass:
1. Acceptable manufacturers:
a. CertainTeed Corporation.
b. Knauf Fiber Glass.
c. Owens Corning Fiberglass Corp.
d. Schuller International, Inc.

2. Characteristics:
a. Type: Fiberglass batts; width equal to framing spacing; integral nailing flanges for faced insulation installed between wood framing members or required to maintain rating over metal framing members.
b. Facing: Flame resistant foil scrim faced; ASTM C665-86, Type III, Class A; 1.0 perm rating maximum; flame spread of 25 or less.
c. R-value: R-19 or as indicated on drawing.

3. Board Insulation:
1. Application: Foundation walls.

2. Application: Under slabs-on-grade.
3. Application: Exterior cavity walls, outboard of sheathing.
4. Type: Extruded polystyrene, rigid.
   a. Standard: ASTM C 578.

4. Vapor Retarder (Not Integral with Insulation):
   1. Application: Exterior walls.
   2. Type: Reinforced 2-ply polyethylene, 6 to 10 mils.

D. Accessories:
   1. Impaling clips, non-thermal short type, and impaling clip adhesive or fasteners to attach impaling clips to substrate to maintain insulation position.
   2. Aluminum channels, 3" wide metal faced joint tape, and other installation materials at spandrel panels in curtain wall system.

E. Sound insulation:
   1. In-wall sound attenuation batts (SAB):
      a. Acceptable products:
         1.) CertainTeed Products Corp.; Sound Control Batts.
         2.) Owens Corning Fiberglas Corp.; Sound Attenuation Batt Insulation.
         3.) Partek Insulation; Paroc Sound Attenuation Batts.
         4.) Schuller International, Inc.; Sound-SHIELD™.
         5.) USG Acoustical Products Company; Thermafiber Sound Attenuation Fire Blankets.
      b. Characteristics:
         1.) Material: ASTM C665-88, Type I, unfaced flexible mineral fiber batt.
         2.) Nominal density: 2.5 PCF.
         3.) Thickness: 3” unless otherwise indicated on Drawings.
         4.) Size: Furnish batts net stud width, minimum; no odd sized pieces permitted.
         5.) Combustibility; ASTM E136-82: Noncombustible.
         6.) Surface burning characteristics; ASTM E84-87.
         7.) Flame spread: Zero.
         8.) Smoke developed: Zero.
         9.) Corrosion: Will not cause or contribute to corrosion.

      c. Lay-in ceiling sound batts:
         1.) Acceptable products:
            a.) CertainTeed Products Corp.; Sound Control Batts.
            b.) Owens Corning Fiberglas Corp.; Sonobatts.
            c.) Partek Insulation; Paroc Sound Attenuation Batts.
      d.) Schuller International, Inc.; Grid-SHIELD™.
      e.) USG Acoustical Products Company; Thermafiber Blankets.

F. Type: Unfaced mineral wool or fiberglass batt blankets; ASTM C665-86, Type I
   1. Thickness: 3” unless otherwise indicated on Drawings.
   2. Size: 2'-0" by 4'-0".

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's product data for each type installation. Cut insulation around obstructions and protrusions. Remove projections interfering with installation.

B. Thermal insulation installation:
   1. General: Comply with manufacturer's installation instructions for conditions encountered.
   2. Batt insulation:
      a) Install in indicated exterior walls with vapor barrier to building interior. Pressure fit batts between metal studs.
      b) FSK faced insulation: Tape joints and facing ruptures; seal each continuous area to surrounding construction to ensure air-tight installation.
      c) Miscellaneous voids and cavity spaces:
      d) Stuff loose batt insulation, unfaced, into miscellaneous voids and cavity spaces not requiring other special insulation types specified in Firestopping Section.
      e) Compact to approximately 40% of normal maximum volume, approximately 2.5 PCF density.
      f) Filling spaces affecting performances of other materials is prohibited.
   3. Spandrel insulation:
      a) Install in aluminum channels or angles fastened to curtain wall system at spandrel panels; completely fill space in frame; maintain 1" clear from spandrel glass inner face to insulation face; tape seal perimeter.
      b) Impaling clip fastener installation:
         1.) Install to substrate using adhesive recommended by fastener manufacturer.
         2.) Space clips not less than 3" from corners of batts and at rate of one fastener per two SF, maximum.
         3.) Install insulation with butted joints.
         4.) Tape joints using specified tape.

   4. Sound insulation installation:
      a) In-wall SAB insulation: Install in indicated sound isolating partitions filling cavities, full partition height and single length in accord with manufacturer's installation instructions.
      b) Lay-in ceiling acoustical blankets: Install over entire indicated ceiling areas in single layer in accord with manufacturer's installation instructions.

END OF SECTION 07 210

SECTION 07 220 - ROOF AND DECK INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. HCFC FREE “Green” Polyiso Rigid board type roof insulation(s) for thermal protection as part of roofing assemblies.

B. Recover board HCFC FREE “Green” Polyiso roof insulation.

C. Roofing crickets.

1.2 RELATED SECTIONS

A. Section 05310 - Steel Deck.

B. Section 06100 - Rough Carpentry: Wood roof blocking and nailers.

1.3 REFERENCES

A. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Insulation Board.

B. ASTM D 312 - Standard Specification for Asphalt Used in Roofing.

C. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings.

D. ASTM E 119 - Standard Test Methods for Fire Tests of Building Constructions and Materials.

E. FM 4450 - Approval Standard - Class I Insulated Steel Roof Decks.

F. FM 4470 - Approval Standard - Class I Roof Covers.

G. LTTR – Long Term Thermal Resistance, using techniques from CAN/ULC S770 based on ASTM C1303

H. UL 263 - Fire Tests of Building Construction and Materials.

I. UL 790 - Tests for Fire Resistance of Roof Covering Materials.

J. UL 1256 - Fire Test of Roof Deck Constructions.

K. ASTM E 2114-01 – Standard Terminology for Sustainability Relative to the Performance of Buildings

L. ASTM 2129 –01 – Standard Practice for Data Collection for Sustainability Assessment of Building Product

1.4 DEFINITIONS

A. HCFC FREE "Green" Polyiso Roof Board Insulation is defined as environmentally friendly, with Zero Global Warming, Zero Ozone Depletion (ODP) as in compliance with the US EPA requirements of January 1, 2003 requirement to eliminate production of HCFC 141b.

B. LTTR (Long Term Thermal Resistance) is defined as using techniques from ASTM C1303, CAN/ULC S770 predicting a foam's R-Value that has been shown to be equivalent to the average performance of a permeably faced foam insulation product over 15 years. In Canada this method is used as the Design R-Value. This applies to ALL foam insulation products with blowing agents other than air, such as Polyiso, "Green" Polyiso, extruded polystyrene and polyurethane. The new method is based on consensus standards in the US and Canada. PIMA has reported this method as providing a better understanding of the thermal performance of foam.

1.5 SUBMITTALS

A. Submit under provisions of Section 01340 and 01610.

B. Product Data:

1. Manufacturer´s HCFC FREE "Green" Polyiso specifications

2. Installation instructions for HCFC FREE "Green" Polyiso insulation board and fasteners

3. Product Data as per ASTM 2129 – 01 Standard for Data Collection for Sustainability Assessment of Building Products

C. Samples:

1. Submit 6 by 6 inch (152 by 152 mm) samples of each board type required.

2. Submit samples of each fastener type required.

D. Shop Drawings: Roof plan showing layout of boards, and fastening patterns, and ventilation and roof edge details.

E. Certificates: System Manufacturer´s or insulation manufacturer's certification that HCFC FREE "Green" Polyiso materials meet Zero ODP (Ozone Depletion Potential) and Zero GWP (Global Warming Potential) specification requirements.

F. Thermal Warranty: Submit sample warranty indicating conditions and limitations.

1.6 QUALITY ASSURANCE

A. HCFC FREE "Green" Polyiso Manufacturer Qualifications:

1. Show evidence of ability to manufacturer products specified with sufficient manufacturing facilities.

a. List dates of HCFC FREE "Green" Polyiso plant conversion and/or full production operation

b. List HCFC chemistry alternative/replacement.

2. Provide past project HCFC FREE “Green” Polyiso installation performance histories for last five years.

B. Regulatory Requirements:

1. American Society for Testing and Materials (ASTM).

2. Factory Mutual (FM).

3. Underwriters Laboratories Inc. (UL) Classification.

4. IBC, and SBCCI Sections on Foam Insulation.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with general requirements specified in Section 01610.

B. Deliver insulation in packages labeled with material name, thermal value and product code.

C. When stored outdoors, stack insulation on pallets above ground or roof deck and cover with tarpaulin or other suitable waterproof coverings. Slit or remove manufacturer´s packaging before covering with waterproof covering.

1.8 PROJECT CONDITIONS

A. Comply with insurance underwriter´s requirements applicable for products of this Section.

B. Do not install insulation on roof deck when water of any type is present. Do not apply roofing materials when substrate is damp or wet.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Atlas Roofing Corporation

Atlas Roofing Corporation,
2000 RiverEdge Parkway, Suite 800, Atlanta, GA 30328
Ph. (770) 933-4478
Fax (770) 952-3170

B. Requests for substitutions will be considered in accordance with provisions of Section 01630.

C. Provide all HCFC FREE “Green” Polyiso roof board insulation from a single manufacturer.

2.2 MATERIALS

A. HCFC FREE “Green” Polyiso Roof Board Insulation: Provide products that comply with the following:

1. ASTM standards specified.
2. Factory Mutual (FM) approvals specified.
3. Underwriters Laboratories Inc. (UL) classifications specified.
4. SBCCI Standard Building Code Sections on Foam Insulation.

B. ACFoam Nail Base: Closed-cell HCFC FREE “Green” polyisocyanurate foam board manufactured using [HCFC] [ACUltra Hydrocarbon] blowing agent and bonded to 7/16 inch thick APA/TECO rated OSB on the top side and a fiber-reinforced felt facer on the bottom; for use with metal roofing, FM 1-90 wind rating; compressive strength - 20 psi.

* IBC, BOCA, ICBO and SBCCI Sections on Foam Insulation.
* APA/TECO rated nailable surface.

FM Standard 4450/4470 Approval (1-105, 1-90, 1-60
ACFoam Nail Base Insulation is approved for Class 1 insulated roof deck construction. Refer to FM Approval Guide for details.

UL Standard 1256 Classification
Insulated metal deck construction assemblies - Construction #120 and #123.

UL Standard 790 Classification
For use with Class A, B or C shingles, metal or tile roof coverings.

UL Standard 263 Fire Resistance Classification (ASTM E119
Some classifications for fire resistance are P225, P230, P259, P508, P510, P514, P701, P717, P719, P723, P728, P732, P734, P739, P801, P815, and P819.

C. LTTR - Insulation "R" Value: 16 Long-term thermal resistance values of the foam were determined in accordance with CAN/ULC-S770. All test samples were third-party selected and tested by an accredited materials testing laboratory.

D. Related Materials:

1. Fasteners: Factory Mutual approved.

2. Base Ply: As recommended by membrane manufacturer.

3. Fasteners: For Nail Base and Vented-R: Atlas Nail Base Fasteners.

4. Asphalt Bitumen: Comply with ASTM D 312, Type III (steep) or Type IV. USE ONLY ON APPROVED BOARD INSULATION TYPES.

a. Provide with labels indicating flash point, softening point, finished blowing temperature, and equiviscous temperature.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roof deck for suitability to receive insulation. Verify that substrate is dry, clean and free of foreign material that will damage insulation or impede installation.

B. Verify that roof drains, scuppers, roof curbs, nailers, equipment supports, vents and other roof accessories are secured properly and installed in conformance with Contract Drawings and submittals.

C. Verify that deck is structurally sound to support installers, materials and equipment without damaging or deforming work.

1. Start of installation indicates installer accepts conditions of existing deck surfaces.

3.2 APPLICATION / INSTALLATION

A. Install specified insulation using approved mechanical fasteners in accordance with manufacturer´s latest written instructions and as required by governing codes and Owner´s insurance carrier.

B. Install with end joints staggered to avoid having insulation joints coinciding with joints in deck. In multi-layer installations, stagger joints in top and bottom layers.

3.3 CLEANING / PROTECTION

A. Remove trash and construction debris from insulation surface prior to application of roofing membrane.

B. Do not leave installed insulation exposed to weather. Cover and waterproof with completed roof system immediately after installation.

1. Temporarily seal exposed insulation edges at the end of each day.

2. Remove and replace installed insulation that has become wet or damaged with new insulation.

C. Protect installed insulation and roof cover from traffic by use of protective covering materials during and after installation

END OF SECTION 07 220

Section 07 260 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Materials and installation of air and moisture barrier over concrete masonry walls, and wall sheathing.

1.02 RELATED SECTIONS:

A. Section 03 300: Cast-In-Place Concrete

B. Section 04 220: Concrete Unit Masonry

C. Section 06 1600Sheathing

E. Section 07 260: Vapor Retarders

F. Section 07 600: Flashing and Sheet Metal

G. Section 07 900: Joint Protection

1.03 REFERENCED DOCUMENTS

A. ASTM Standards

1. C 79 Specification for Gypsum Sheathing Board
2. C 297 Test Method for Tensile Strength of Flat Sandwich Constructions in Flatwise Plane
3. C 1177 Specification for Glass Mat Gypsum Substrate for Use as Sheathing
4. D 522 Test Methods for Mandrel Bend Test of Attached Organic Coatings
5. D 882 Test Methods for Tensile Properties of Thin Plastic Sheeting
6. D 2247 Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
7. D 3273 Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
8. E 84 Test Method for Surface Burning Characteristics of Building Materials
9. E 96 Test Methods for Water Vapor Transmission of Materials
10. E 283 Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
11. E 330 Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
12. E 331 Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
13. E 1233 Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential

B. Building Code Standards

1. SBCCI PST & ESI Evaluation Guide on Floor, Wall, and Roof Systems (Testing for Moisture Protection Barriers), Evaluation Guide 119.
2. UBC 26-9, Method of Test for the Evaluation of Flammability Characteristics of Exterior, Nonload-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus
3. ICBO Acceptance Criteria for Exterior Insulation and Finish Systems, AC 24
4. CCMC Technical Guide on Air Barriers

C. Gypsum Association

1. GA-600 Fire Resistance Design Manual
2. GA-253 Recommended Specifications for the Application of Gypsum Sheathing
3. GA-254 Fire-Resistant Gypsum Sheathing

D. American Plywood Association

1. E30 Residential and Commercial Construction Guide

E. Proprietary Specifications

1. 102250 Georgia-Pacific Corporation, "Dens Glass® Gold Sheathing"
2. AATCC (American Association of Textile Chemists and Colorists), Test Method127, Water Resistance: Hydrostatic Pressure Test

F. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)

1. 2001 ASHRAE Handbook--Fundamentals

1.04 DESIGN REQUIREMENTS

A. Deflection Criteria: maximum allowable deflection normal to the plane of the wall: L/240

B. Wind Load: conform with code requirements.

C. Moisture Control:

1. Minimize condensation within the assembly.
2. Drain water directly to the exterior where it is likely to penetrate components in the wall assembly (windows and doors, for example).
3. Provide flashing to direct water to the exterior in accordance with code requirements, including, above window and door heads, beneath window and door sills, at roof/wall intersections, decks, intersections of lower walls with higher walls, and at the base of the wall.

D. Air Barrier Continuity: provide continuous air barrier system of compatible air barrier components.

E. Mechanical Ventilation: maintain pressurization and indoor humidity levels in accordance with recommendations of ASHRAE (see 2001 ASHRAE Handbook—Fundamentals).

1.05 PERFORMANCE REQUIREMENTS

A. Sto Guard® Waterproofing/Air Barrier Performance Data

TEST	METHOD	CRITERIA	RESULTS
1. Aging/Water Penetration Resistance	AATCC 127 (Water Column)	Resist 21.6 in (55 cm) water for 5 hours before and after aging	No water penetration before and after aging
2. Structural Loading/Water Penetration Testing	ASTM E 1233 / ASTM E 331	No water at exterior plane of sheathing. (exterior gypsum, Dens-Glass Gold, plywood, OSB) after 10 cycles @ 80% design load and 75 minutes water spray at 6.24 psf (299 Pa) differential	No water penetration
3. Cyclic Pressure/Water Penetration Testing	ASTM E 283/ ASTM E 331	No water penetration or evidence of elevated moisture levels in plywood sheathing after 10 cycles of conditioning at 299 Pa (6.24 psf) positive and negative pressure followed by 75 minutes water spray at 6.24 psf (299 Pa) pressure differential with water spray rate of 5 gal/ft^2·hr (3.4 L/m^2·min)	No water penetration, no elevated moisture levels
4. Water Resistance Testing	ASTM D 2247	Absence of deleterious effects after 14 day exposure	No deleterious effects after 14 day exposure
5. Resistance to Mold Growth	ASTM D 3273	No mold growth after 28 days	No mold growth after 28 day exposure
6. Freeze/Thaw Resistance	ICBO Method (AC 24)	No visible effects (cracking, checking, delamination, erosion) when viewed at 5x	No visible deleterious effects at 5x magnification
7. Water Vapor Transmission	ASTM E 96 Method B (Water Method)	Measure	Sto Gold Fill®: 17.3 perms [994 ng/(Pa·s·m^2)] Sto Gold Coat®: 5.7 perms [327 ng/(Pa·s·m^2)]
8. Air Leakage: Wall Assembly with Sto Gold Fill & Sto Gold Coat	ASTM E 283 (SBCCI PST & ESI Method)	<0.06 cfm/ft^2 @ 1.56 psf (0.00030 m^3/s·m^2 @ 75 Pa)	0.0044 cfm/ft^2 (0.000022 m^3/s·m^2)
9. Air Leakage: Sto Gold Fill	ASTM E 283 (CCMC Technical Guide Method)	< 0.003 ft^3/min·ft^2) @ 1.56psf (< 0.02 L/s·m^2 @ 75 Pa)	< 0.0002 ft^3/min·ft^2 (< 0.0014 L/s·m^2)
10. Structural Integrity	ASTM E 330	2 inches (51 mm) water pressure (positive & negative) for 1 hour.	No loss of structural integrity
11. Dry Tensile Strength	ASTM D 882	20 lbs/in (3503 N/m) minimum before and after aging	Sto Gold Fill®:159 pli (27.8 kN/m) before aging 213 pli (37.3 kN/m after aging

12. Flexibility	ASTM D 522	No cracking or delamination using 1/8" (3 mm) mandrel at 14°F (-10°C) before and after aging	No cracking or delamination before and after aging
13. Tensile Adhesion	ASTM C 297	>15 psi (103 kPa)	Gypsum (ASTM C 79): >30 psi (206 kPa) Gypsum (ASTM C 1177): > 30 psi (206 kPa) Exposure 1 OSB: > 50 psi (344 kPa) Exterior Plywood: > 90 psi (620 kPa)
14. Surface Burning	ASTM E 84	Flame Spread: <25 Smoke Developed: <450	Flame Spread: 5 Smoke Developed: 10 NFPA Class A, UBC Class 1 building material
15. Fire Resistance	ASTM E 119	I hour	Meets criteria for 1 hour fire resistance rating when installed over I hour fire resistance rated sheathing
16. Fire Propagation	UBC 26-9	No increase in fire hazard	Pass

1.06 SUBMITTALS

A. Manufacturer's specifications, details and product data.

B. Samples for approval as directed by architect or owner.

C. Manufacturer's standard warranty.

D. Prepare and submit project-specific details (when required by contract documents).

1.07 QUALITY ASSURANCE

A. Manufacturer requirements

1. Manufacturer of exterior wall air and moisture barrier materials for a minimum of 25 years in North America.
2. ISO 9001:2000 Certified.

B. Contractor requirements

1. Knowledgeable in the proper use and handling of Sto materials.
2. Employ skilled mechanics who are experienced and knowledgeable in air and moisture barrier application, and familiar with the requirements of the specified work.
3. Provide the proper equipment, manpower and supervision on the job-site to install the system in compliance with Sto's published specifications.

1.08 DELIVERY, STORAGE AND HANDLING.

A Deliver materials in their original sealed containers bearing manufacturer's name and identification of product.

B. Protect coatings (pail products) from freezing temperatures and temperatures in excess of 90° F (32° C). Store away from direct sunlight.

1.09 PROJECT/SITE CONDITIONS

A. Maintain ambient and surface temperatures above 40° F (4° C) during application and drying period, minimum 24 hours after application of air and moisture barrier.

B. Provide supplementary heat for installation in temperatures less than 40° F (4° C) or if surface temperature is likely to fall below 40° F (4° C). *(Note: surface temperature is lower than air temperature at night).*

C. Provide protection of surrounding areas and adjacent surfaces from application of materials.

1.10 COORDINATION/SCHEDULING

(The work in this section requires close coordination with related sections and trades. Sequence work to provide protection of construction materials from weather deterioration)

A. Coordinate installation of foundation waterproofing, roofing membrane, windows, doors and other wall penetrations to provide a continuous air barrier.

B. Provide protection of rough openings before installing windows, doors, and other penetrations through the wall.

C. Provide sill flashing to direct water to the exterior before windows and doors are installed.

D. Install window and door head flashing immediately after windows and doors are installed.

F. Install diverter flashings wherever water can enter the assembly to direct water to the exterior.

1.11 WARRANTY

A. Provide manufacturer’s standard warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sto Corp.

2.02 WATERPROOFING/AIR BARRIER

A. Sto Guard®

1. Joint Treatment: Sto Gold Fill®—ready mixed acrylic based flexible joint treatment for rough opening protection and joint treatment of wall sheathing.

2. Waterproof Coating: Sto Gold Coat®—ready mixed acrylic based waterproof coating for wall sheathing.

2.03 REINFORCING MESH

A. Sto Guard® Mesh - nominal 4.2 oz/sq. yd. (142 g/m^2), self-adhesive, flexible, symmetrical, interlaced glass fiber fabric, with alkaline resistant coating for compatibility with Sto materials *(used with Sto Gold Fill™ to reinforce rough openings, inside and outside corners and sheathing joints).*

B. Sto Detail Mesh - nominal 4.2 oz/sq. yd. (142 g/m^2), flexible, symmetrical, interlaced glass fiber fabric, with alkaline resistant coating for compatibility with Sto materials *(used with Sto Gold Fill™ to reinforce rough openings, inside and outside corners, sheathing joints, and minor cracks in concrete and masonry).*

2.04 MIXING

A. Mix materials with a clean, rust-free electric drill and paddle.

B. Do not dilute materials with water or add other ingredients.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect concrete and concrete masonry surfaces for:

1. Contamination — algae, chalkiness, dirt, dust, efflorescence, form oil, fungus, grease, mildew or other foreign substances.
2. Surface absorption and chalkiness.
3. Cracks — measure crack width and record location of cracks.
4. Damage and deterioration.
5. Moisture content and moisture damage — use a moisture meter to determine if the surface is dry enough to receive the air and moisture barrier and record any areas of moisture damage or excess moisture.
6. Compliance with specification tolerances — record areas that are out of tolerance (greater than 1/4 inch in 8-0 feet [6 mm in 2438 mm] deviation in plane).

B. Inspect sheathing application for compliance with applicable requirement:

1. Glass mat faced gypsum sheathing — Georgia Pacific Publication 102250

C. Report deviations from the requirements of project specifications or other conditions that might adversely affect the air and moisture barrier installation. Do not start work until deviations are corrected.

3.02 SURFACE PREPARATION

A. Remove surface contaminants and replace damaged sheathing.

B. Spot surface defects in sheathing with joint treatment.

C. Repair cracks, spalls, or other damge in concrete or concrete masonry surfaces

3.03 INSTALLATION

A. Install waterproofing/air barrier in compliance with manufacturer's written instructions.

END OF SECTION 07 260

SECTION 07 270 - FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes firestopping for the following:

1. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
3. Sealant joints in fire-resistance-rated construction.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 7 Section "Joint Sealants" for non-fire-resistive-rated joint sealants.
2. Coordinate this Section With Firestopping in Divisions 15 and16.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.

B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.

C. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.

1.4 SUBMITTALS

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

B. Product data for each type of product specified.

1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.

C. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements.

D. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."

E. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer.

1.6 SEQUENCING AND SCHEDULING

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

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.

B. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:

1. Permanent forming/damming/backing materials including the following:

    a. Semirefractory fiber (mineral wool) insulation.
    b. Ceramic fiber.
    c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
    d. Fire-rated formboard.
    e. Joint fillers for joint sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

2.2 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

A. Ceramic-Fiber and Mastic Coating: Ceramic fibers in bulk form formulated for use with mastic coating, and ceramic fiber manufacturer's mastic coating.

B. Ceramic-Fiber Sealant: Single-component formulation of ceramic fibers and inorganic binders.

C. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, nonshrinking foam.

H. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping/ gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
2. Grade for Horizontal Surfaces: Pourable (self-leveling) grade for openings in floors and other horizontal surfaces.
3. Grade for Vertical Surfaces: Nonsag grade for openings in vertical and other surfaces.

2.3 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

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

B. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.

C. Single-Component, Nonsag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:

1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.

B. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from

firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.

3.2 INSTALLING THROUGH-PENETRATION FIRESTOPS

A. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

B. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:

1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.

3.3 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

A. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.

B. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.4 CLEANING

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

END OF SECTION 07 270

SECTION 07 410 - MANUFACTURED ROOF PANELS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Factory-formed metal roofing, soffits, including flashing, accessories, miscellaneous trim, drip flashing, closures and sealant.

B. Related Sections: Section(s) related to this section include:
1. Section 05 310: Steel Deck
2. Section 06 100: Rough Carpentry
3. Section 07 620: Sheet Metal Flashing and Trim
4. Section 07 920: Joint Sealants
5. Section 07 220 Roof and Deck Insulation

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
ASTM AZ50 - Specification for Steel Sheet, Aluminum-Zinc Alloy Coated (Galvanized) by the Hot Dip Process, General Requirements (Galvalume).
ASTM B209 - Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
ASTM E283/1680 - Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen.
ASTM E331/1646 - Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Status Air Pressure Difference.
ASTM 1592-95 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference

B. Underwriters Laboratories (UL Classified Tests):
UL 263 - Fire Tests of Building Construction and Materials
UL 580 - Test for Wind-Uplift Resistance of Roof Assemblies
UL 790 - Test for Fire Resistance of Roof Covering Materials
UL 2218 - Impact Resistance Test

C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
1. SMACNA Architectural Sheet Metal Manual

1.03 SYSTEM DESCRIPTION

A. Performance Requirements: Provide sheet metal roofing that has been manufactured, fabricated and installed to withstand structural and thermal movement, wind loading and weather exposure to maintain manufacturer's performance criteria without defects, damage, failure of infiltration of water.
1. Wind-Uplift: Roof panel assembly shall comply with UL Classification 580 for UL Classified 90 rated assemblies
2. Static Air Infiltration: Completed roof system shall have a maximum of .06 cfm/sf with 6.24 kPa air pressure differential as per ASTM E283/1680.
3. Water Infiltration: No evidence of water penetration at an inward static air pressure differential of not less than 6.24 psf (43 kPa) and not more than 12.0 psf (83 kPa) as per

ASTM E331/1646.

1.04 SUBMITTALS

A. General: Submit listed submittals in accordance with Owner-Contractor Agreement and Section 01 340 Shop Drawings, Product Data and Samples.
   1. Product Data: Submit product data, including manufacturer's SPEC-DATA product sheet, for specified products.

B. Shop Drawings:
   1. Submit complete shop drawings and erection details, approved by the metal roofing manufacturer, to the architect for review. Do not proceed with manufacturer of roofing materials prior to review of shop drawings and field verification of all dimensions. Do not use drawings prepared by the architect for shop or erection drawings.

   2. Shop drawings show roof plans, elevations, methods of erection, and flashing details.

C. Performance Tests:
   1. Submit certified test results by a recognized testing laboratory in accordance with specified test methods for each panel system.

D. Samples: Submit selection and verification samples for finishes, colors and textures.

E. Quality Assurance Submittals: Submit the following:
   1. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical requirements.
   2. Manufacturer's Instructions: Manufacturer's installation instructions.

F. Closeout Submittals: Submit the following:
   1. Operation and Maintenance Date: Operation and maintenance data for installed products in accordance with Section 01 700 Project Closeout, Section 01 730 Operating and Maintenance Data and Section 01 740 Warranties. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.

   2. Project Warranty: Warranty documents specified herein.

A: Manufacturers warranty: Submit, for owner's acceptance, manufacturers standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not limited of, other rights the owner may have under the contract documents.

   1. Warranty Period: Twenty years commencing on Date of Substantial Completion.

   2. Record Documents: Project record documents for installed materials in accordance with Section 01 700 Project Closeout and Section 01 720 Project Record Documents.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in the installation of work similar to that required for this project.

1. Certificate: Submit certificate indicating qualifications.

B. Sheet Metal Industry Standard: Comply with Sheet Metal and Air Conditioning Contractors National Association (SMACNA) *Architectural Sheet Metal Manual*.

C. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, Manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section 01 200 Project Meetings.

1.06 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division 1 Product Requirements Sections.
1. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Identify fabricated components with UL 90 Classified label where appropriate.

C. Storage and Protection: Store materials protected from exposure to harmful conditions. Store material in dry, above ground location.
1. Stack prefinished material to prevent twisting, bending, abrasion, scratching and denting. Elevate one end of each skid to allow for moisture to run off.
2. Prevent contact with material that may cause corrosion, discoloration or staining.
3. Do not expose to direct sunlight or extreme heat trim material with factory applied strippable film.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

1.08 WARRANTY

A. Project Warranty: Refer to Section 01 740 for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not a limitation of, other rights Owner may have under the Contract Documents.

1. Warranty Period: Twenty years commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 SHEET METAL ROOFING

A. Manufacturer used as standard of quality: Petersen Aluminum Corporation; Atlanta, Georgia. Tel: (404) 797-2143. Fax: (770) 420-2522. Email: sales@petersenmail.com.

B. Acceptable Manufacturers
1. Centria Architectural Sytems, Inc., Tel. 1-800-759-7474, Email: info@centria.com.
2. AEP-Span, Tel. 1-800-272-2466, Email: tech@ascprofiles.com.
3. Englert, Inc., Tel. 732-826-8614, Email: englert.inc@prodigy.net.
4. McElroy Metal Inc., Tel. 770-949-4724
5. MBCI, Inc., Tel. 877-512-6224
6. Berridge Manufacturing Company, Tel. 770-941-5141

C. Tite-Loc Panel panels and trim:
1. Seam Height: 2” (50.2 mm) minimum seam height.
2. Material: 22 ga G-90 Hot-dipped Galvanized Steel
3. Panel Dimension: 18 in o.c.
4. Eave Notching: (Factory produced eave notching for trimmed eave panels)
5. Texture: Smooth
6. Rating: UL Classified 90 rated (wind uplift) panel assembly.
7. Flashing and Trim: 24 ga Steel
8. Fasteners: Tite-Loc galvanized steel, non-penetrating high performance clips for roofing application and UL Classified 90 rated (wind uplift) assemblies and standard clips for fascia applications.
9. Sealant Bead: Factory applied sealant bead.
10. Acceptable Curb and Equipment Support units:
    a. LM Curbs - Longview, TX.
    b. Kentuckiana Curbs - Louisville, KY.
    c. Greenheck, Inc.

D. Panel Finish:
1. Panel Topside: Paint Finish - Champagne
2. Panel Underside: Polyester washcoat with dry film thickness of 0.3 mils.

E. Flashing and Trim: Manufacturer’s standard flashing and trim profiles, factory formed, gauge as recommended by manufacturer, color and finish to match metal roofing panels.

F. Substitutions: Refer to Section 01 630, Product and Substitutions for requirements.

2.02 RELATED MATERIALS

A. General: Coordinate use of related materials:

1. Underlayment: Grace Ice and Water Shield
2. Plywood Deck: 5/8” (16 mm) nominal thickness. Refer to Section 06 100, Rough Carpentry.

3. Nailable Insulation: 3" (76.2 mm) nominal thickness classified polyisocyanurate foamed plastic, 2 pct density, with factory laminated 7/16" (11 mm) thick APA rated Oriented Strand Board (OSB). Refer to Section 07 210 Building Insulation.
4. Sealants: Elastometic joint sealants. Refer to Section 07 920 Joint Sealants.
5. Bituminous Coating: Cold-applied asphaltic mastic. Provide compound free of asbestos fibers, sulfur components and other harmful impurities. Refer to Section 07 160 Bituminus Dampproofing.

2.03 FABRICATION

A. General:
1. Continuous Length: Fabricate panels 55' (16.2 m) and less in one continuous length.
2. Trim and Flashings: Fabricate trim and flashings from same material as roof system material.
3. Portable Roll Former: Panels fabricated by portable roll former shall not be approved.

2.04 FINISHES

A. Factory Applied Finish:
1. Topside: Full-strength fluoropolymer (70% Kynar 500 or Hylar resin) system of 1.0 mil (.025 mm) total dry film thickness.
2. Underside: Wash coat of 0.3 - 0.4 mil dry film thickness.
3. Texture: Smooth texture, dull matte specular gloss 25 - 35% at 60.
4. Protective film: Strippable vinyl film applied during panel fabrication and finishing.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, recommendations and installations instructions for substrate verification, preparation requirements and installation.
1. Strippable Film: Remove manufacturer's protective film, if any, from surfaces of roofing panels.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for project installation in accordance with manufacturer's instructions.

3.03 PREPARATION

A. Coordination: Coordinate metal roofing with other Work (drainage, flashing and trim, deck substrates, copings, walls) and other adjoining work to provide a non-corrosive and leak-proof installation.

B. Dissimilar Metals: Prevent galvanic action of dissimilar metals.

3.04 INSTALLATION

A. General: Install metal roofing panels to profiles, patterns and drainage indicated and required for leak-proof installation. Provide for structural and thermal movement at work. Seal joints for leak-proof installation.

1. Seams: Provide uniform, neat seams.
2. Fasteners: Conceal fasteners where possible in exposed work. Cover and seal fasteners and anchors for watertight and leak-proof installation.
3. Sealant-Type Joints: Provide sealant-type joint where indicated. Form joints to conceal sealant. Comply with Section 07 920 Joint Sealant for Sealant installation.

3.05 FIELD QUALITY REQUIREMENTS

A. Special Inspections: Owner reserves right to perform post installation testing of installed sheet metal roofing.

3.06 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3.07 PROTECTION

A. Protection: Protect installed product from damage during construction.

END OF SECTION 07 410

SECTION 07 620 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes sheet metal flashing and trim in the following categories:

1. Exposed trim, gravel stops, and fasciae.
2. Metal flashing, counter flashing and base flashing
3. Gutters and downspouts
4. Exterior wall flashing and expansion joints.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 7 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
2. Division 7 Roofing Sections for flashing and roofing accessories installed integral with roofing membrane as part of roofing-system work.

1.3 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.

B. Fabricate and install flashings at roof edges to comply with recommendations of FM Loss Prevention Data Sheet 1-49 for the following wind zone:

1. Wind Zone 2: Wind pressures of 31 to 45 psf.

1.4 PROJECT CONDITIONS

A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufacturers: Beach Sheet Metal Co., Inc.; Englert, Inc.; Hohmann & Barnard, Inc.; National Sheet Metal Systems, Inc.; Park City Rain Gutter; Petersen Aluminum Corp.; Sandell Manufacturing Company, Inc.; SBC Industries Flashings.

B. Flashing and Sheet Metal:
1. Application: Metal counterflashing and base flashing.

2. Application: Exterior wall flashing and expansion joints.
3. Application: Gutters and downspouts.
4. Application: Exposed metal trim and fascia units.
5. Application: Ridge and soffit vents.
6. Metal: Zinc-coated steel.
   a. Standard: ASTM A 653, G90 hot-dip galvanized, 2-Coat 70% Fluoropolymer, 20-gauge (.0359 inch).
7. Metal: Stainless steel.
   a. Standard: AISI Type 302/304, ASTM A 666, 2D annealed finish, 28 gauge (.0156 inch).
8. Metal: Sheet aluminum.
   a. Standard: ASTM B 209, alloy 3003, prefinished 2-coat 70% fluoropolymer, 20 gauge (.0359 inch).
9. Flexible Sheet Membrane Flashing: Nonreinforced flexible black elastic sheet, 50 to 65 mils thick, synthetic rubber.
10. Laminated Composition Sheet Flashing: 5 ounce copper sheet laminated between 2 layers of bituminous impregnated Kraft paper or saturated fabric.
11. Elastic Expansion Joints: Factory-fabricated metal-flanged edges to fit curbs and curb substrate.
12. Soffit Vents: Continuous aluminum strip soffit vents
13. Ridge Vents: Baffled ridge vent suitable for direct application of shingles.

C. Auxiliary Materials:
1. Solder compatible with metal.
2. Bituminous isolation coating.
3. Mastic and elastomeric sealants.
4. Epoxy seam sealer.
5. Rosin-sized building paper slip sheet.
6. Polyethylene underlayment.
7. Reglets and metal accessories.
8. Gutter and conductor head guards.
9. Asphaltic roofing cement.

2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

B. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coat.

C. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

D. Epoxy Seam Sealer: 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints.

E. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.

F. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.

2.3 FABRICATION, GENERAL

A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.

B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

D. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

E. Expansion Provisions: Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

F. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

G. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.

H. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

I. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.

1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.4 SHEET METAL FABRICATIONS

A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

B. Roof-Drain Flashing: Fabricate from the following material:

1. Copper: 16 oz./sq. ft.

C. Scuppers: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

D. Exposed Trim, Gravel Stops, and Fasciae: Fabricate from the following material:

1. Aluminum: 0.050 inch thick.

E. Counterflashing: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

F. Flashing Receivers: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

G. Drip Edges: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

H. Equipment Support Flashing: Fabricate from the following material:

1. Aluminum-Zinc Alloy-Coated Steel: 0.0276 inch thick.

I. Roof-Penetration Flashing: Fabricate from the following material:

1. Aluminum-Zinc Alloy-Coated Steel: 0.0276 inch thick.

J. Overhead-Piping Safety Pans: Fabricate from the following material:

1. Galvanized Steel: 0.0396 inch thick.

K. Roof-to-Wall Expansion-Joint Cover: Fabricate from the following material:

1. Aluminum: 0.050 inch thick.

M. Thru Wall Flashing: Fabricate from the following:

1. Laminated Copper

N. Sill Flashing: Fabricate from the following material:

1. Laminated Copper

2.5 ALUMINUM FINISHES

A. General: Comply with Aluminum Association's (AA) "Designation System for Aluminum Finishes" for finish designations and application recommendations.

B. Class I, Clear Anodic Finish: AA-C22A41 (Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.

B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Roof-Edge Flashings: Secure metal flashings at roof edges according to FM Loss Prevention Data Sheet 1-49 for specified wind zone.

D. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

E. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.

1. Use joint adhesive for nonmoving joints specified not to be soldered.

F. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

G. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.

H Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant,

interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 inches and bed with sealant.

I. Overhead-Piping Safety Pans: Suspend pans from pipe and install drain line to plumbing waste or drain line.

J. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.

K. Roof-Penetration Flashing: Coordinate roof-penetration flashing installation with roofing and installation of items penetrating roof. Install flashing as follows:

1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
2. Seal and clamp flashing to pipes penetrating roof, other than lead flashing on vent piping.

3.2 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION 07 620

SECTION 07 712 - MANUFACTURED GUTTER BRACKETS

PART 1- GENERAL

A. RELATED DOCUMENTS

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

B. SUMMARY

1. This Section includes manufactured gutter brackets for support of half-round gutters, and designed to fit onto the ends of exposed rafter tails.
2. Related Sections: The following Sections contain requirements that relate to this Section:
   a) Half-round gutters, gutter clips, downspouts, and other rain drainage accessories are specified in other Division 7 sections.
   b) Roofing flashing and trim installed integral with roofing,

C. SUBMITTALS

1. General: Submit the following in accordance with Conditions of Contract and Division-1 Specification Sections.
   a) Product data, Specialties, and Accessories: Manufacturer's technical product data, installation instructions and general recommendations for the specified product.

D. PROJECT CONDITIONS

1. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible durability of work and protection of materials and finishes.

E. QUALITY ASSURANCE

1. All work of this Section shall comply with the applicable standards set forth in the following publications:
   a) Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) Architectural Sheet Metal Manual.
   b) Copper Development Association (C.D.A.) Copper Brass Bronze Design Handbook.
   c) Revere Copper Products, Inc.; Copper and Common Sense.
2. Installer Qualifications: Installer of Work of this Section shall be a qualified and experienced tradesperson, accustomed to installing work of the nature and scope indicated, with at least 5-years prior experience in similar installations. Refer to manufacturer’s web site for additional installer qualifications.
3. Field Measurements: Prior to ordering brackets, Installer shall take field measurements to verify rafter dimensions, rafter tail alignment, and other related field conditions. Installer shall coordinate with gutter bracket manufacturer regarding tolerances, alignments, and other critical dimensions.

F. DELIVERY, STORAGE, AND HANDLING

1. Package brackets and other components so that they will not be damaged or deformed during transportation.

2. Handling: Exercise care in unpacking and storing to prevent bending, warping, twisting, and surface damage.
3. Store products so as not to be exposed to accumulated water. Do not store in contact with other materials that might cause staining, deterioration, or other surface damage.

PART 2 - PRODUCTS

A. MATERIALS

1. Stainless Steel Hook: SS 316; 0.25-inch thick except as otherwise recommended by manufacturer for application shown.
2. Stainless Steel Flanges: SS 316; 0.093-inch thick except as otherwise recommended by manufacturer for application shown.

B. FABRICATION

1. Provide stainless steel gutter brackets consisting of a hook for supporting the gutter, with a flange for screw attachment into each side of the exposed rafter tails. Brackets shall accommodate half-round gutters, and shall be custom-fabricated by the manufacturer to fit the specified gutter size, roof slope, rafter tail profile, and rafter thickness.
   a) Brackets shall be factory-fabricated and assembled.
   b) Bracket components shall be cut by the manufacturer using a high-pressure water-jet process.
   c) Bracket components shall be tumbled for de-burring and face finishing.

C. PRODUCTS

1. Products: Provide gutter brackets as manufactured by The Bungalow Gutter Bracket Co., P.O. Box 22144, Lexington, KY 40522-2144 (859) 335-1555 Fax (859) 266-3563 (www.bungalowgutterbracket.com).
2. Bracket Size (based on half-round gutter size):
   a) 6 inch
3. Bracket Style:
   A) Custom bracket as defined on drawings.
4. Rafter Tail Thickness:
   a) Thickness as indicated on the drawings.
5. Roof Slope:
   a) 1/12 Feet

D. MISCELLANEOUS MATERIALS AND ACCESSORIES:

1. Screw Fasteners: Provide silicone bronze round-head wood screws, as recommended and supplied by gutter bracket manufacturer. Match finish of exposed heads with material being fastened.
2. Accessories: Provide accessories as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gauge required for performance.

PART 3- EXECUTION

A. EXAMINATION

1. Prior to beginning installation, Installer shall examine rafters and other field conditions affecting installation of gutter brackets, and shall notify Contractor of any conditions that are unsuitable, or that might result in an unsatisfactory installation. Installer shall not begin installation until such conditions have been properly remedied.
2. Commencement of bracket installation shall constitute Installer's acceptance and approval of field conditions.

B. INSTALLATION REQUIREMENTS

1. General: Except as otherwise indicated, comply with manufacturer's written installation instructions and recommendations, and with the CDA design handbook. Refer to manufacturer's web site for additional installation requirements.
2. Gutters shall be placed below the roof slope line in such a manner so that snow and ice can slide clear. Refer to *Architectural Graphics Standards – Eighth Edition* for a diagram showing recommended placement.
3. Anchor brackets securely to each side of rafter tails by manufacturer's approved methods.
   a) Use only silicone bronze screws as supplied by the manufacturer.
   b) Do no bend bracket flanges, or otherwise force flanges onto rafter tails. Use manufacturer-provided shims to adjust for proper, slight friction fit.
4. Bracket spacing not to exceed 32 inches o.c. unless otherwise approved by the Architect.
5. Set units true to indicated slope.

C. CLEANING AND PROTECTION

1. Clean exposed stainless surfaces, removing substances that might cause corrosion of copper or deterioration of finishes.
2. Protection: Advise Contractor of required procedures for surveillance and protection of gutter bracket work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion.

END OF SECTION 07 712

SECTION 07 720 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Prefabricated curb and equipment support units.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 6 Section "Rough Carpentry" for roof deck and nailers.
2. Division 7 Section for roofing types and roofing accessories included as part of roofing Work.
3. Division 7 Section "Flashing and Sheet Metal" for metal flashing, valleys, gutters, and downspouts.

1.3 SUBMITTALS

A. Product data for each type of product specified. Submit manufacturer's detailed technical product data, installation instructions and recommendations, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Coordination Drawings: Submit coordination drawings for items interfacing with or supporting mechanical or electrical equipment, ductwork, piping, or conduit. Indicate dimensions and locations of items provided under this Section, together with relationships and methods of attachment to adjacent construction and to mechanical or electrical items.

C. Provide Roof Equipment Suppports and Curbs in DIVISION 15 .Sections ,When specified, And meet the requirements of this section for miscellaneous flashing and installation.

1.4 QUALITY ASSURANCE

A. Standards: Comply with the following:

1. SMACNA "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap-flashing to coordinate with type of roofing indicated.
2. NRCA "Roofing and Waterproofing Manual" details for installation of units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Prefabricated Curb and Equipment Support Units:

a. Curbs, Inc.
b. The Pate Co.
c. ThyCurb Div./ThyBar Corp.

2.2 MATERIALS, GENERAL

A. Aluminum Sheets: ASTM B 209 for Alclad alloy 3005H25 or alloy and temper required to suit forming operations with mill finish, unless indicated otherwise.

B. Structural-Quality Galvanized Steel Sheet: ASTM A 446 with G90 coating complying with ASTM A 525, Grade C, or to suit manufacturer's standards.

C. Insulation: Manufacturer's standard rigid or semirigid glass-fiber board of thickness indicated.

D. Wood Nailers: Softwood lumber, pressure treated with water-borne preservatives for above-ground use, complying with AWPA C2; not less than 1-1/2 inch thick.

E. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.
1. Where removal of exterior exposed fasteners affords access to building, provide nonremovable fastener heads.

F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene or polyvinyl chloride, or block design of sponge neoprene.

G. Bituminous Coating: SSPC-Paint 12, solvent-type bituminous mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coating.

H. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

2.3 FINISHES

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations on applying and designating finishes.

B. Finish designations prefixed by AA conform to the system for designating aluminum finishes established by the Aluminum Association.

C. Class I, Clear-Anodized Finish: AA-C22A41 (Chemical Finish: etched, medium matte; Anodic Coating: Class I Architectural, clear film thicker than 0.7 mil) complying with AAMA 607.1.

2.4 PREFABRICATED CURBS AND EQUIPMENT SUPPORTS

A. General: Comply with loading and strength requirements as indicated where units support other work. Coordinate dimensions with rough-in information or shop drawings of equipment to be supported.

1. Fabricate of structural-quality, hot-dip galvanized or galvalume sheet steel, factory-primed and prepared for painting with welded or sealed mechanical corner joints.
2. Provide complete with cant strips and base profile coordinated with roof insulation thickness. Provide preservative-treated wood nailers at tops of curbs, coordinate with thickness of insulation and roof flashing as indicated, tapered as necessary to compensate for roof deck slopes of 1/4 inch per foot and less.
3. Unless otherwise indicated or required for strength, fabricate units of minimum 0.0747-inch thick metal, and to minimum height of 12 inches.
4. Sloping Roofs: Where slope of roof deck exceeds 1/4 inch per foot, fabricate curb/support units with height tapered to match slope to level tops of units.

B. Curb: Double-wall curb construction with cant strips and 1-inch insulation, of height indicated or, if not otherwise indicated, for mounting with height 9 inches above line of roofing.

1. Where roof deck slopes more than 1/4 inch per foot, provide tapered curb heights to match slope and to level tops of units.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive accessory units, vapor barriers, roof insulation, roofing and flashing, as required, to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses, as well as inward and outward loading pressures.

1. Except as otherwise indicated, install roof accessory items according to construction details of NRCA "Roofing and Waterproofing Manual."

B. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.

C. Cap Flashing: Where cap flashing is required as component of accessory, install to provide adequate waterproof overlap with roofing or roof flashing (as counterflashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.

3.2 CLEANING AND PROTECTION

A. Clean exposed metal and plastic surfaces according to manufacturer's instructions. Touch up damaged metal coatings.

END OF SECTION 07 720

SECTION 07 920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Sealants, caulks, and accessories to prevent water or moisture intrusion, weatherseal exterior joints, seal interior working joints, and caulk interior items for visual appearance or acoustical properties.

B. Related sections:
   1. Section 07210: Building Insulation.
   2. Section 07840: Firestopping.

1.2 REFERENCES

A. Standards of the following as referenced:
   1. ASTM.
   2. Federal Specifications (FS).
   3. Sealant, Waterproofing, and Restoration Institute (SWRI).
   4. Underwriters' Laboratories, Inc. (UL).

B. Industry standards:
   1. UL 263-84 (Rev 1989): *Fire Tests of Building Construction and Materials*.
   2. SWRI: *The Professional's Guide,* 1990 edition.

1.3 DEFINITIONS

A. Terms:
   1. (To) caulk(ing), or (to) seal(ing): Verb, present tense; process of filling joints with caulk or sealant; includes appropriate joint preparation and related accessories installation.
   2. Caulked: Verb, past or future tense; joint already filled or to be filled with sealant or caulk; includes appropriate joint preparation and related accessories installation.
   3. Caulk: Noun; mastic type material used in filling joints and seams, having properties of adhesion and cohesion; not required to have extensibility and recovery properties, usually applied to static interior joints for visual effect.
   4. Joint failure: Finished joint exhibiting one or more of the following characteristics:
      a) Leaks air or water.
      b) Sealant
      c) migrates.
      d) loses adhesion or cohesion.
      e) does not cure.
      f) discolors.
      g) stains adjacent work.
      h) develops bubbles, air pockets, or voids.
   5. Sealant: Noun; weatherproof elastomer used in filling and sealing joints, having properties of adhesion, cohesion, extensibility under tension, compressibility, and recovery; designed to make joints air and waterproof or weatherproof. Material is

generally designed for application to joints at exterior of structures and other joints, exterior and interior, subject to movement or working.
6. Standard selection, colors: Manufacturer's normal, stocked.
7. Standard special selection, colors: Manufacturer's additional colors at no price increase; generally not stocked; longer lead time.

1.4 SUBMITTALS

A. Product data:
1. Manufacturer's product description, indicating conformance with specified requirements and installation instructions for each type sealant or caulk; include specific requirements for primer and backer rod type.
2. Indicate substrate preparation requirements.
3. *"Manufacturer's Safety Data Sheets"*, (M.S.D.S.), for materials.

B. Samples:
1. Material colors: Samples of manufacturer's standard sealants' and caulks' colors.
2. Material samples: Actual materials or literature depicting actual material colors. Architect reserves right to reject work not in accord with selected colors, based upon samples submitted.
3. Selecting manufacturer meeting specified requirements, except for minimum color range requirements requires responsibility for furnishing special colors within color range requirements.

C. Quality control submittals:
1. Certificates: Indicate materials supplied or installed are asbestos free.

1.5 PROJECT CONDITIONS

A. Environmental requirements:
1. Installing materials under adverse weather conditions is prohibited; install within each manufacturer's recommended temperature range for each product.
2. Install materials when temperatures are in lower third of manufacturer's recommended installation temperature, wherever joint width is affected by ambient temperature variations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Silicone sanitary sealant, SSS-1:
1. Acceptable products:
a) ChemRex Inc.; Sonneborn® Sonolastic® Omniplus.
b) Dow Corning Corp.; #786 Mildew Resistant Silicone Sealant.
c) GE Silicones; Sanitary 1700 Sealant.
d) Pecora Corp.; #863 Tru White or #898 Neutral Cure.
2. Characteristics:
a) Type: One part silicone rubber; mildew and stain resistant, ASTM C920-86, Type S, Grade NS, Class 25.

b) Design: 25% extension and 25% compression.
c) Colors: Indicated in SCHEDULES Article.

B. One part polyurethane sealant: Polytite Manufacturing Corp.; Polytite R
1. Characteristics: ASTM D3574, ASTM G53, and ASTM D816, Density 10 lb/cu ft .
a) Design: 25% extension and 25% compression based on manufacturer's data and expected width of actual joints under most extreme conditions.
b) Colors: TO BE SELECTED BY ARCHITECT.

C. Acrylic-latex caulk, ALC-1:
1. Acceptable products:
a.) Bostik Construction Products Division; Chem-Calk 600.
b.) ChemRex Inc.; Sonneborn® Sonolac.
c.) W.R. Meadows, Inc.; Easaply.
d.) Pecora Corp.; AC-20 + Silicone.
2. Characteristics:
a) Flexible, paintable, non-staining, non-bleeding, acrylic emulsion; ASTM C834-76 (1986).
b) Colors: TO BE SELECTED BY ARCHITECT.

D. Butyl caulk, BC-1:
1. Acceptable products:
a) ChemRex Inc.; Sonneborn® Butakauk.
b) Pecora Corp.; BC-158.
c) Tremco, Inc.; Butyl Sealant.
2. Characteristics:
a) Type: One part butyl rubber caulk, ASTM C1085-87.
b) Color: Black.

E. Acoustical sealant, ACS-1; acceptable products:
1. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
2. Tremco, Inc.; Tremco Acoustical Sealant.
3. U.S. Gypsum Company; Sheetrock Acoustical Sealant.

F. Two-part polysulfide sealant, PSSV2-1:
1. Acceptable products:
a) . ChemRex Inc.; Sonneborn® Sonolastic® Two Part.
b) . Morton International, Specialty Chemicals Group; 2235-M.
c) . Pecora Corp.; Synthacalk GC-5.
2. Characteristics:
a) Two-part polysulfide polymer; ASTM C920-86, Type M, Class 25, Grade NS.
b) Colors: TO BE SELECTED BY ARCHITECT.

2.1 ACCESSORIES

A. Joint cleaner: Type recommended by sealant manufacturer for substrates indicated.

B. Joint primer/sealer: Type recommended by sealant manufacturer for conditions encountered.

C. Bond breaker tape: Plastic type tape recommended by sealant manufacturer for application to contact surfaces preventing bond to substrate or joint filler for sealant material performance.

D Sealant backer rod:
1. Non-rated:
   a) Type, generic: Compressible rod stock closed cell foam, open cell foam, soft cell foam, or neoprene foam; type recommended by sealant manufacturer for material compatibility and conditions encountered.
   b) Rod size and shape to control joint depth, break bond at joint bottom, form optimum shape of bead on back side, and minimize possibility of extrusion when joint is compressed.

E. Rated:
1. Acceptable product: Backer Rod Mfg. & Supply Company, Inc.; Ultra Block®.
2. Characteristics:
   a) Type, generic: Fire blocking material consisting of textile glass fibers and unexpanded vermiculite bonded in sheet form to fiberglass facing; used in UL Configuration 1 or Configuration 2.) Fire tests: Pass requirements when used in assembly tested in accord with ASTM E119-83 or UL 263-84 (Rev 1989), Designs J-900 and U-900 and classified as two hour fire and temperature rated ASTM E814-83 for F Rating or T Rating.
   b) Smoke and fuel contributed tests on firestopping materials: ASTM E84-87; Flame Spread 10, Smoke Developed 5.
   c) Use with UL assembly and UL listed silicone or two-part polyurethane sealants or acrylic latex caulks for indicated rating.

F. Tooling agent: Agent recommended by sealant or caulk manufacturer to ensure contact of material with inner joint faces.

G. Divider strips: Synthetic rubber or closed cell synthetic foam not less than 1/16" thick and full depth of caulking material; approved by manufacturers of dissimilar materials as being compatible with each other.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection:
1. Protect adjacent surfaces by applying masking material or manipulating application equipment to keep materials in joint. Allowing tape to touch cleaned surfaces receiving sealant if masking materials are used is prohibited.
2. Remove misapplied caulking materials from surfaces using solvents and methods recommended by manufacturer.
3. Restore surfaces to original condition and appearance where sealants or caulks have been removed.

3.2 APPLICATION

A. General:

1. Sealants: Comply with sealant material manufacturer's printed installation instructions, requirements of ASTM C962-86 and SWRI.
2. Caulks, comply with the following:
   a) Caulk manufacturer's printed installation instructions and;
   b) Latex based caulks: ASTM C790-84.
   c) Butyl based caulks: ASTM C804-83.

B. Surface preparation, general:
1. Clean joint surfaces immediately before caulking joints. Remove dirt, insecure coatings, moisture, and substances interfering with bond.
2. Etch concrete and masonry joint surfaces to remove alkalinity, unless sealant or caulk manufacturer's product data indicates alkalinity does not interfere with bond and performance; use sealant or caulk manufacturer's recommended materials in accord with sealant or caulk manufacturer's reviewed installation instructions and product data.
3. Roughen joint surfaces on vitreous coated and similar non-porous materials, unless sealant or caulk manufacturer's data indicates equal bond strength as porous surfaces. Rub with fine abrasive cloth or wool to produce dull sheen.

C. Primer: Prime or seal joint surfaces when recommended by sealant or caulk manufacturer in accord with sealant or caulk manufacturer's recommendations. Allowing primer/sealer to spill or migrate onto adjacent surfaces is prohibited.

D. Backer rod:
1. Non-rated: Install for sealants, except where specifically recommended to be omitted by sealant manufacturer for application indicated; install correct size for each joint type to sealant manufacturer recommended depth.
2. Rated: Install for sealants in rated configurations; install correct size for each joint type to conform to UL tested joint for indicated rating.

E. Sealant or caulks:
1. Employ installation techniques ensuring materials are deposited in uniform, continuous ribbons without gaps or air pockets with complete wetting of joint bond surfaces.
2. Fill joint forming slight cove to prevent joint from trapping moisture and debris where horizontal joints are between horizontal and vertical surface.
3. Allowing materials to overflow or spill onto adjacent surfaces is prohibited. Use masking tape or other precautionary devices to prevent adjacent surfaces staining.
4. Remove excess and misplaced materials as work progresses. Clean adjoining surfaces to eliminate evidence of misplaced materials without damage to adjacent surfaces or finishes.
5. Cure in accord with manufacturer's product data to obtain high early bond strength, internal cohesive strength, and surface durability.

3.3 SCHEDULES

A. General:
1. Schedule below indicates general sealant and caulk locations and usage type.
2. Use UL listed sealants or caulks in combination with rated backer rod for indicated rated assemblies.

B. Sealants:
   1. Silicone sanitary sealant, SSS-1:
      a) Plumbing fixtures perimeter mounted on walls to adjacent materials.
      b) Top and edges of backsplashes at countertops.
      c) Locations requiring NSF, USDA, or other sanitary code requirements.
   2. One-part polyurethane sealant, PSV1-1:
      a) Interior vertical working expansion and control joints.
      b) Exterior and interior door and window frames perimeter to adjacent materials.
   3. Acoustical sealant, ACS-1: Perimeter and penetrations of sound rated partitions; not for exposed applications where painting or coating is required.
   4. Two-part polysulfide sealant, PSSV2-1: Continuous immersion service; elevator pit sumps and other sumps.

C. Caulks:
   1. Acrylic latex caulk, ALC-1: Interior non-working cosmetic joints between similar and dissimilar adjacent materials.
   2. Butyl caulk, BC-1: Use continuous double bead at sill or threshold of exterior swinging doors.

D. Colors not already indicated above: Selected by Architect from manufacturer's standard color selection.

END OF SECTION 07 920

SECTION 08 110 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Related sections:
1. Section 04220: Concrete Masonry Units.
2. Section 07920: Joint Sealants.
3. Section 08210: Wood Doors.
4. Section 08710: Door Hardware.
5. Section 08800: Glazing.
6. Section 09260: Gypsum Board Assemblies.
7. Section 09910: Paints.

B. Standards of the following as referenced:
1. American National Standards Institute (ANSI).
2. ASTM.
3. Federal Specification (FS).
4. Factory Mutual (FM).
5. National Fire Protection Association (NFPA).
6. Steel Door Institute (S.D.I.).
7. Steel Structures Painting Council (SSPC).
8. Underwriters' Laboratories, Inc. (UL).
9. Warnock Hersey (WH).

C. Industry standards:
1. NFPA 80: *Fire Doors and Windows*, 1995 edition.
2. S.D.I.: *Technical Data Series*.
3. SSPC: *Systems and Specifications*, September 1989 edition.
4. WH: *1995 Certification Listings.*

1.2 SYSTEM DESCRIPTION

A. Performance requirements, primer paints and surface preparation: Coordinate surface preparation and primer paint selection to be compatible with final finish paints. Use paints specified in Paints Section as basis for selections.

1.3 SUBMITTALS

A. Product data:
1. Manufacturer's standard product data.
2. Manufacturer's primer selection.
a) Indicate compatibility with steel doors and frames location for exposure and service; indicate compatibility of primer and finish paint specified in Paints Section. If shop primer specified below is not compatible with finish paint system, indicate additional requirements necessary for finish paints.
b) Indicate compatibility with paint systems specified in Paints Section if items have specific requirements indicated to be topcoated in other Sections.
c) Indicate compliance with:
d) Mercury-free composition requirements.

e) VOC limits, when mixed and thinned.
f) Indicate lead content.

3. Shop drawings:
   a) Indicate door and frame elevations, sections, materials, gauges, finishes, fabrication and erection details, location of door hardware by dimension, and details of openings and louvers; use same reference numbers indicated on Drawings for details and openings.
   b) Door schedule: Furnish complete using same reference numbers indicated on Drawings for details and openings. Include all Drawing numbered openings; indicate openings not part of this Section as "by others".

B. Samples:
1. Door: 1'-0" by 1'-0" corner section showing door construction for each type door specified.
   a) Welded frame: 1'-0" by 1'-0" head and jamb corner section showing mitered and welded corner construction.
   b) Knocked-down frame: 1'-0" lengths of head and jamb members, with mitered corner construction.
   c) Anchors: Each type.
   d) Approved samples will be used to verify and match actual components shipped.

C. Quality control submittals:
1. Certificates:
   a) Indicate compliance with S.D.I. 116-79.
   b) Indicate materials supplied or installed are asbestos free.
   c) Manufacturer's, indicate membership in S.D.I.

1.4 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer/fabricator: Member of S.D.I. and listed in “Approved Manufacturers” Paragraph.

B. Certifications: Furnish fire-rated components bearing factory applied labels of UL, FM, or WH; give component rating.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing and shipping: Mark doors and frames with door opening mark number corresponding with reviewed door schedule.

B. Acceptance at site:
1. Unload materials; check frames and other materials; verify construction matches approved samples.
2. Note damaged or abraded prime coated surfaces.
3. Reject frames and other materials not in accord with approved samples; immediately remove rejected items from site.

C. Storage and protection:
1. Store materials in dry area under cover, 4" off floor, minimum, on raised

platforms, in vertical position with minimum 1/4" space between doors; protect from direct contact of water.
2. Avoid using nonvented plastic or canvas shelters creating humidity chambers.
3. Immediately remove wet wrappers.

1.6 SEQUENCING AND SCHEDULING

A. Furnish anchors and items built-in under construction activities specified in other sections in accord with scheduling not causing delays.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers:
1. Amweld Building Products, Inc.
2. Ceco Door Products.
3. Curries Company
4. Mesker Door, Inc.
5. D & D Specialties.
6. Republic Builders Products Corp.
7. Steelcraft.

2.2 MATERIALS

A. Steel:
1. ASTM A366-85, cold rolled steel sheet free of scale, pitting or surface defects.
2. Galvanized frames and doors:
a) Type: ASTM A525-87, zinc coated, coating designation G60.
b) Galvanized steel locations:
c) Exterior openings.
d) Toilets.
e) Showers.

B. Wipe coat galvanized steel (WCGS) components are prohibited.

C. Primer paint minimum requirements; use shop primer compatible with Paints Section specified primers and topcoats: The Glidden Company; GLID-GUARD All-Purpose Metal Primer No. 5229 to pin hole free; 1.4 mils DFT, minimum.

D. Door hardware: Specified in Door Hardware Section.

E. Glass: Specified in Glazing Section.

2.3 MANUFACTURED UNITS

A. Frame construction:
1. General:
a) Roll formed or pressed steel frames for doors, sidelights, tubular mullions and borrowed lights, and other indicated openings.
b) Dust cover boxes or mortar guards: Not less than 26 gauge steel at hardware mortises to be set in masonry partitions.

c) Reinforcement for scheduled hardware: S.D.I.-107-84, galvanized for galvanized units, and as follows:
d) Hinge: Eight gauge, minimum.
e) Strike: 16 gauge, minimum.
f) Closer: 14 gauge, minimum.
g) Projection weld to frame.

B. Welded frame:
2. Welded steel corner construction; weld type; use for appropriate frame construction:
a) Roll formed frames:
b) Standard of quality: Ceco Door Products; Welding Type T-3.
c) Characteristics: Machine-mitered corners with faces mitered, butted stops; full weld joints, outside face weld and full web weld.
d) Pressed steel frames:
e) Standard of quality: Ceco Door Products; Welding Type V-4.
f) Characteristics: Saw-mitered corners with faces and stops mitered; full weld joints, inside face weld only.
g) Dress and grind exposed welds smooth.
h) Welded frames with temporary spreaders during shipment, handling, and installation.
i) Gauge: 16 gauge.
j) Locations: Frames in masonry and concrete walls, fire rated frames, and frames over 7'-0" in height in gypsum board partitions.
k) Stops: 5/8" deep minimum.
l) Labels: Attached label for labeled openings.

C. Knock down type:
a) Mitered, reinforced, interlocking head and jamb members.
b) Gauge: 16 gauge.
c) Locations: Frames in gypsum board partitions.
d) Labels: Attached label for labeled openings.

D. Manufacturer's standard rubber, neoprene, or silicone silencers; locations Indicated below.

E. Frame anchors:
1. Wall anchors for frame attachment to masonry construction:
a) Type: Adjustable, flat, corrugated, or perforated, T-shaped anchors with leg not less than 18 gauge by 2" wide by 10" long; hot dip galvanized.
b) Anchors at 2'-0" O.C., maximum, each jamb.
c) UL type anchors for fire-rated frames.
2. Wall anchors for frame attachment to gypsum board partitions:
a) Manufacturer's standard adjustable metal stud type; 18 gauge, minimum.
b) Anchors at 2'-0" O.C., maximum, each jamb.
c) UL type anchors for fire-rated frames.
3. Floor anchors: Clip type to receive two fasteners per clip, 18 gauge steel, minimum; use additional jamb anchor where floor anchor can not be used.
4. 3/8" dia. countersunk, flat head, stove bolts in expansion shields; space 6" maximum from top and bottom of frame, 2'-0" maximum between at in-place masonry or concrete.

5. Ceiling struts: 1/4" by 2" steel struts spot welded to jambs, each side; extend to building structure for frames not anchored to masonry or concrete construction. Center strut at head for frames over 4'-0" wide.

F. Door construction:
   1. General:
      a) Reinforcement for scheduled hardware: S.D.I.-107-84, galvanized for galvanized units, and as follows:
      b) Door hinge: Eight gauge, minimum.
      c) Lock: 16 gauge, minimum.
      d) Closer: 14 gauge, minimum.
      e) Projection weld to door.
      f) End closures; top and bottom: Flush channel treatment with no holes or openings; inverted channel prohibited on ** exterior ** doors.
      g) Prohibited practice: Visible joints or seams on exposed faces.
   2. Classification, exterior units:
      a) Grades, models, and gauge; insulated: SDI Designation Grade III, Extra Heavy Duty, Model 2, Seamless; 16 gauge material.
      b) Construction: SDI Designation Hollow Metal.
      c) Core: Honeycomb.
   3. Thickness: 1-3/4", unless otherwise indicated.
   4. Astragals: Extruded aluminum split astragal consisting of two piece adjustable base and cover set in anodized aluminum finish with wool pile insert; packaged separately from door for field attachment.
   5. Design: Indicated.
   6. Labels: Attached label indicating classified rating for labeled openings.

G. Applied stops: Formed, 20 minimum gauge steel with mitered corners; prepare for gasket, if indicated. Attach using countersunk oval head machine screws at 1'-0" O.C. maximum.

2.4 FABRICATION

A. Shop assembly:
   1. General:
      a) Fabricate members in accord with S.D.I.-100-91, except where more stringent requirements are specified. Using fabricators other than S.D.I. member is prohibited.
      b) Fabricate doors and frames to sizes and profiles indicated on reviewed shop drawings; provide specified joinery matching approved samples.
      c) Glaze using indicated glazing and sealant type.
   2. Hardware preparation:
      a) Factory prepare units for hardware in accord with templates furnished under Door Hardware Section and in accord with S.D.I.-100-91.
      b) Reinforcement: Reinforce components for hardware installation in accord with S.D.I.-107-84.
      c) Punch single leaf frames to receive three silencers; double frames to receive one silencer per leaf, at head. Install silencers.
   3. Shop finishing:
      a) Preparation prior to primer application:
      b) Grind smooth and flush welds exposed in final construction; mechanically

clean, SSPC-SP3, weld flux and mill scale from exposed and concealed surfaces.

c) Repair abraded or damaged galvanized surfaces prior to application of surfacing materials. Prepare surfaces in accord with SSPC-SP2, Hand Tool Cleaning or SSPC-SP3, Power Tool Cleaning, minimum. Apply zinc rich primer meeting SSPC-Paint 20, Type I, Inorganic at 2.5 mils DFT, minimum.

d) Ferrous metals, not galvanized:

e) Clean surfaces after fabrication and immediately prior to shop painting in accord with SSPC-SP2, Hand Tool Cleaning; SSPC-SP3, Power Tool Cleaning; or SSPC-SP6, Commercial Blast Cleaning. Surface cleaning requirements are dependent on final service location and environment. Solvent clean in accord with SSPC-SP1 to remove grease, oil, and contaminants; wipe dry with dry cloth.

f) Apply primer specified in "Primer paint" Paragraph in MATERIALS Article above to specified mils DFT. Apply within four hours after cleaning and before rust-bloom occurs. Paint only in conditions acceptable to shop primer paint manufacturer's application data.

g) Galvanized metal:

h) Repair abraded or damaged galvanized surfaces prior to application of surfacing materials. Prepare surfaces in accord with SSPC-SP2-1982, Hand Tool Cleaning or SSPC-SP3-1982, Power Tool Cleaning; apply zinc rich primer meeting SSPC-Paint 20, Type I, Inorganic at 2.5 mils DFT, minimum.

i) Wash with xylol to remove grease, oil, and contaminants; wipe dry with dry cloth.

j) Prepare galvanized sheared surfaces in same manner as "Ferrous metals, not galvanized" subparagraph above.

k) Apply primer specified in "Primer paint" Paragraph in MATERIALS Article above to specified mils DFT.

4. Coat entire frames and accessories after fabrication, inside and outside.
5. Coat entire doors after fabrication.
6. Tolerances:
   A. Frames:
      a) Overall dimensions: 3/64" in opening height; +1/16", -1/32" in opening width.
      b) Throat opening: 1/16".
      c) Frame depth: 1/32".
7. Doors:
      a) Overall dimensions: 3/64" maximum variation in width and length; 1/16" variation in thickness.
      b) Door squareness: Å1/16" variation in diagonal dimension.
      c) Flatness: 3/32" when measured with straight edge from corner to corner; each face.
8. Other tolerances: Indicated in S.D.I.-117-88.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of conditions: Verify openings and accessories are in correct position.

3.2 INSTALLATION

A. Setting frames:
   1. General: Install in accord with S.D.I.-105-92, S.D.I.-110-84, and as follows.
   2. Welded frames:
      a) .Set welded frames in position prior to beginning partition work. Brace frames until permanent anchors are set.
      b) .Set anchors for frames as construction activities progress. Install anchors at hinge and strike levels. Provide mortar guards at frame mortises in masonry walls.
      c) .Remove temporary braces and spreaders after wall construction is complete.
      d) .Fire-rated frames: Install in accord with requirements of NFPA 80-1995.
      e) .Install welded frames in prepared openings in concrete and masonry walls using countersunk bolts or expansion shields and anchors in accord with S.D.I.-111-F-91; fill or plug frame hole completely after doors and hardware are installed.
   3. Knock-down frames:
      a) Install in accord with reviewed shop drawings. Secure using adjustable jamb and base anchors.
      b) Fire-rated frames: Install in accord with NFPA 80-1995 requirements.
      c) Completed installation: Tight fitting joints, without gaps or offsets.
   4. Door installation:
      a) Install steel doors in frames, use hardware specified in Door Hardware Section.
      b) Edge clearances at doors:
      c) Between door and frame, at head and jambs: 1/8".
      d) Meeting edges of door pairs and at mullions: 1/8".
      e) Transom panels, without transom bars: 1/8".
      f) Sills:
      g) Without thresholds: 3/8" maximum above finish floor.
      h) With thresholds: 3/4" maximum above finish floor.
   5. Fire-rated doors: Install in accord with requirements of NFPA 80-1995.

END OF SECTION 08 110

SECTION 08 210 - WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Related sections:
1. Section 08110: Steel Doors and Frames.
2. Section 08710: Door Hardware.
3. Section 08800: Glazing.

1.2 REFERENCES

A. Standards of the following as referenced:
1. American National Standards Institute (ANSI).
2. American Woodwork Institute (AWI).
3. Federal Specification (FS).
4. Door and Hardware Institute (DHI).
5. Hardwood Plywood & Veneer Association (NPVA).
6. National Electrical Manufacturer's Association (NEMA).
7. National Fire Protection Association (NFPA).
8. National Wood Window and Door Association (NWWDA).
9. Underwriters' Laboratories, Inc. (UL).
10. Warnock-Hersey (WH).

B. Industry standards:
1. ANSI/DHI A115-W Series: *Wood Door Preparation Standards;* includes series W.1 through W.9.
2. AWI: *Design/Builderural Woodwork Quality Standards, Guide Specifications, and Quality Certification Program*, Fifth edition, 1988.
3. DHI:
a) WDHS-1: *Template Book Criteria for Wood Doors.*
b) WDHS-2: *Recommended Fasteners for Wood Doors.*
c) WDHS-3: *Recommended Hardware Locations for Wood Flush Doors.*
d) WDHS-4: *Machining Doors for Hardware.*
4. NFPA 80: *Fire Doors and Windows*, 1995 edition.
5. NWWDA: *Industry Standard I.S. Series*.
6. WH: *1995 Certification Listings.*

1.3 SUBMITTALS

A. Shop drawings: Indicate door sizes, construction, and door hardware locations. Dimension and detail openings for glass lites.

B. Samples:
1. Sets of three matched, 8" by 11" samples for each facing or type specified; indicate construction.
2. 1'-0" length of linear materials specified.

C. Quality control submittals:
1. Certificates: Indicate materials supplied or installed are asbestos free.

D. Contract closeout submittals:
   1. Warranty: Manufacturer's executed warranty.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Member of NWWDA and AWI.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing and shipping: Protect each door leaf in plastic bag or carton; clearly mark each leaf with manufacturer's name, brand name, rating, and identifying number.

B. Storage and protection:
   1. Store doors in space having controlled humidity between 30% and 60%; stack doors flat, off floor.
   2. Seal edges of doors immediately after delivery, unless factory sealed.
   3. Provide protection for door faces in contact with other surfaces. Cover door stacks with breathable waterproof cover.
   4. Walking on or stacking other materials on top of doors is prohibited. Do not drag doors across one another.
   5. Follow NWWDA I.S. 1-A-93, G-20, *Care and Installation at Job Site.*

1.6 WARRANTY

A. Special warranty:
   1. Doors:
      a) Interior doors: Life of installation.
      b) Causes for replacement:
      c) Delamination.
      d) NWWDA I.S. 1-A-93, T-1: Telegraphing of stile, rail, or core through face causing surface variation exceeding 1/100" in any 3" span.
      e) NWWDA I.S. 1-A-93, T-2: Warp or twist exceeding 1/4" in door face plane.

B. Provide for finished replacement; include Project site refinishing, labor, and materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers:
   1. Five ply flush doors:
      a) Algoma Hardwoods, Inc.
      b) Buell Door Company.
      c) Doors, Inc.
      d) Eagle Plywood and Door Mfgrs., Inc.
      e) Eggers Industries, Inc.
      f) Weyerhaueser Company.

2.2 MANUFACTURED UNITS

A. Flush doors:

1. Solid core:
   a) Type: NWWDA I.S. 1-A-93, Premium Grade.
   b) Assembly, general: NWWDA I.S. 1-A-93, PC-HPDL-5; five ply construction.
   c) Core: ANSI A208.1, 1-LD-2 grade particleboard core.
   d) Vertical and horizontal edges: Bonded to solid core; NWWDA T.M.6, Type II gluelines.
   e) Adhesive: Commercial Standard CS-171, Type I for exterior and high moisture doors; Type II for other interior doors.
   f) Blocking and reinforcement: NWWDA I.S. 1-A-93, HB-#; HB-# required for hardware specified in Door Hardware Section.
   g) Stiles: Factory applied plastic laminate stiles laminated to manufacturer's standard construction hardwood.
   h) Edge bands, moldings, and trim; NWWDA I.S. 1-A-93, G-12: Hardwood.

B. Mineral core:
   1. Type: NWWDA I.S. 1-A-93, Custom Grade.
   2. Assembly, general: NWWDA I.S. 1-A-93, FD-5 90 MIN, B label; FD-5 60 MIN, B label; FD-5 45 MIN, C label; or FD-5 20 MIN, 20 min. five ply construction; label requirements indicated in SCHEDULE.
   3. Core: Asbestos free mineral composition core.
   4. Vertical and horizontal edges: Bonded to core; NWWDA T.M.6, Type II gluelines.
   5. Adhesive: Commercial Standard CS-171, Type II.
   6. Blocking, rails, and reinforcement; salt free:
   7. NWWDA I.S. 1-A-93, HB-#; HB-# required for hardware specified in Door Hardware Section in combination with 2" minimum before fitting, Georgia-Pacific Firestop® high density mineral with 1130 lb. screw holding power minimum.
   8. Stiles; salt free: Manufacturer's standard rated construction for rating scheduled stiles with factory applied plastic laminate.
   9. Edge bands, moldings, and trim, salt free; NWWDA I.S. 1-A-93, G-12: Fire-retardant treated maple or birch.
   10. Core: Asbestos free mineral composition core.
   11. Vertical and horizontal edges: Bonded to core; NWWDA T.M.6, Type II gluelines.
   12. Adhesive: Commercial Standard CS-171, Type II.
   13. Labels: UL or WH factory applied labels for ratings indicated on Drawings.

C. Doorskins:
   1. Clear Maple, match book, consistent graining and coloration.
   2. NEMA Standard LD-3.1-1991, Grade GP-50.
   3. Furnish astragals at meeting edge of door pair, wood beads, and applied moldings; same material and quality as door face; meet NWWDA Grade.
   4. Thickness: 1-3/4" thickness unless otherwise indicated.
   5. Finish for transparent and opaque surfaces: Finish selected by Design/Builder from NWWDA I.S. 1-A-93, G-16, Super finish.

D. Fire resistant glazing sealant, acceptable product: Rectorseal, Inc.; Metalcaulk Series for installation of wire glass in openings.

2.3 FABRICATION

A. Shop assembly:
   1. Fabricate doors to NWWDA I.S. 1-A-93, G-13 Workmanship and AWI Sections 1300 and 1400 as applicable for Grade specified and specified criteria. Utilize hot press method for face layup; bond faces to core material.
   2. Fabrication details; use below unless otherwise indicated:
      a) Meeting edge for door pairs:
         1) Non-rated and 20 minute doors: NWWDA I.S. 1-A-93, G-12, Option E4 Tee Astragal.
         2) Rated doors: NWWDA I.S. 1-A-93, G-12, Option E7 Metal Edge Guard Astragral.
      b) Vision panel trimming:
         1) Non-rated and 20 minute doors: NWWDA I.S. 1-A-93, G-12, Option M3, Lip Moulding for glazing, same rating as door.
         2) Rated doors: NWWDA I.S. 1-A-93, G-12, Option M4 Metal Vision Frame.
   3. Cut and fit to sizes and supplied hardware templates prior to finishing.
   4. Fabricate openings in labeled doors in accord with manufacturer's inspection service procedure and under label service; finish.
   5. Seal edges and machined surfaces immediately after fitting and cutting.
   6. Maintain integrity of lead lined doors in fabrication.

B. Shop finishing for prefinished doors to finish requirements specified above.

C. Tolerances:
   1. Not prefit doors; width, height, and thickness: 1/16".
   2. Machined for hardware:
      a) Width: 1/32".
      b) Height and thickness: 1/16".
      c) Hardware location: 1/32".
      d) Locks and hinges: +1/32" -0.
   3. Prefit clearances:
      a) Top and hinge edge: 1/8".
      b) Single door lock edge: 1/8".
      c) Pair meeting edge, per leaf: 1/16".
   4. Squareness: Maximum 1/8" difference in diagonal measurements.

2.4 SOURCE QUALITY CONTROL

A. Inspection:
   1. Allowable color and grade variation: Select doors for natural finish for uniformity in color and grain and inconspicuous joints in face veneers.
   2. Adjacent doors and doors viewed together with color and grain meeting NWWDA standards specified above.

B. Verification of performance: Stamp, brand, or label each door identifying manufacturer, trade association of which he is member, grade and type of door, or complying industry standard.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install in accord with NWWDA I.S. 1-A-93, G-20, *Care and Installation at Job Site.*
2. Provide cutouts for door grilles and glass lites, without damage to door faces if not factory prepped. Field fabricated openings in rated doors are prohibited.
3. Machine doors for hardware using templates furnished by door hardware manufacturer, if not factory prepped.
4. Seal cut-outs immediately after cutting or machining with one coat of solvent type sealer.
5. Replace or rehang doors which bind or sag and doors with improper machining or cut-outs visible in finished construction activities.
6. Clean soil and smudge marks and handling defects from doors. Replace doors from which marks cannot be removed.
7. Install fire-rated doors in accord with requirements of NFPA 80-1995. Removing rating labels is prohibited.

B. Tolerances:
   1. Variation from specified clearances: +1/32", -0.
   2. Variation in edge alignment, pairs of doors, each leaf: 1/16" maximum.
   3. Clearances around door perimeter:
      a) Hinge side: 1/16".
      b) Latch edge: 1/8" (+0", -1/16").
      c) Meeting edges, pairs of doors: 1/8" total.
      d) Bottoms: 1/4" above threshold or floor finish except where undercutting is indicated.

END OF SECTION 08 210

SECTION 08 330 - OVERHEAD COILING GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes overhead coiling grille for the food servery window.

B. Related Sections include the following:

1. Division 8 Section "Door Hardware" for lock cylinders and keying.
2. Division 16 Section "Conductors and Cables" for electrical service and connections for powered operators, and accessories.
3. Division 16 Section "Disconnect Switches and Circuit Breakers" for disconnect switches and circuit breakers for powered operators.

1.3 DEFINITIONS

A. Operation Cycle: One complete cycle of a grille begins with the grille in the closed position. The grille is then moved to the open position and back to the closed position.

1.4 PERFORMANCE REQUIREMENTS

A. Operation-Cycle Requirements: Design overhead coiling grille components and operator to operate for not less than 20,000 cycles.

1.5 SUBMITTALS

A. Product Data: For each type and size of overhead coiling grille and accessory. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide roughing-in diagrams, operating instructions, and maintenance information. Include the following:

1. Setting drawings, templates, and installation instructions for built-in or embedded anchor devices.
2. Summary of forces and loads on walls and jambs.
3. Motors: Show nameplate data and ratings; characteristics; mounting arrangements; size and location of winding termination lugs, conduit entry, and grounding lug; and coatings.

B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's data sheets.

1. Wiring Diagrams: Detail wiring for power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring and between components provided by grille manufacturer and those provided by others.

C. Samples for Verification: Of each type of exposed finish required, prepared on Samples of size indicated below and of same thickness and material indicated for Work. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who is an authorized representative of the overhead coiling grille manufacturer for both installation and maintenance of units required for this Project.

B. Source Limitations: Obtain overhead coiling grilles through one source from a single manufacturer.

1. Obtain operators and controls from the overhead coiling grille manufacturer.

C. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

1. Atlas Door Corp.; Div. of Clopay Building Products Co.
2. Overhead Door Corporation.
3. Wayne-Dalton Corp.

2.2 GRILLE CURTAIN MATERIALS AND CONSTRUCTION

A. General: Fabricate overhead coiling grille curtain consisting of a network of 5/16-inch- (8-mm-) minimum diameter horizontal rods, or rods covered with tube spacers, spaced as indicated. Interconnect rods by vertical links approximately 5/8 inch (16 mm) wide, spaced as indicated and rotating on rods.

1. Aluminum Grilles: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Endlocks: Continuous end links, chains, or other devices at ends of rods, locking and retaining grille curtain in guides against excessive pressures, maintaining curtain alignment, and preventing lateral movement.

C. Bottom Bar: Manufacturer's standard continuous channel, tubular shape, or 2 angles, finished to match grille.

1. Astragal: Provide a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene, between angles or fitted to shape, as a cushion bumper for interior grille.
2. Provide motor-operated grilles with combination bottom astragal and sensor edge.

D. Curtain Jamb Guides: Manufacturer's standard extruded-aluminum shape having curtain groove with return lips or bars to retain curtain. Provide continuous integral wear strips to prevent metal-to-metal contact and minimize noise of travel. Provide removable stops on guides to prevent overtravel of curtain.

2.3 HOODS AND ACCESSORIES

A. Hood: Form to entirely enclose coiled curtain and operating mechanism at opening head. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sag.

1. Fabricate aluminum hoods, complying with ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and not less than 0.032 inch (0.8 mm) thick, for aluminum grilles.
2. Shape: Round.
. Provide removable metal soffit when hood is mounted above ceiling of same material and finish of curtain, unless otherwise indicated.

B. Push/Pull Handles: For push-up-operated or emergency-operated grilles, provide lifting handles on each side of grille.

1. Provide pull-down straps or pole hooks for grilles more than 84 inches (2130 mm) high.

C. Slide Bolt: Fabricate with side locking bolts to engage through slots in tracks for locking by padlock, located on single-jamb side, operable from coil side.

D. Fabricate locking device assembly with lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bar to engage through slots in tracks.

1. Locking Bars: Full-disc Cremone type, both jamb sides, operable from inside and outside.

E. Chain Lock Keeper: Suitable for padlock.

F. Where grille unit is power operated, provide safety interlock switch to disengage power supply when grille is locked.

G. Mounting Tube Frame: Provide manufacturer's standard mounting tube frame designed to support grille; factory fabricated from structural-steel tubes; fastened to floor and structure

above grille; to be built into wall construction; and complete with anchors, connections, and fasteners.

2.4 COUNTERBALANCING MECHANISM

A. General: Counterbalance grille by means of adjustable-tension steel helical torsion spring, mounted around a steel shaft and contained in a spring barrel connected to the curtain. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Brackets: Provide mounting brackets of manufacturer's standard design, either cast-iron or cold-rolled steel plate.

2.5 FINISHES, GENERAL

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

B. Manufacturer's standard mill finish.

2.9 ELECTRIC GRILLE OPERATORS

A. General: Provide electric grille operator assembly of size and capacity recommended and provided by grille manufacturer for grille and operational life specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking grille, manual chain hoist and accessories required for proper operation.

B. Comply with NFPA 70.

C. Emergency Egress Release: Provide grille with flush, wall-mounted handle mechanism, for ADA-compliant egress feature, not dependent on electric power, that allows grille to open to permit passage and automatically resets motor drive, without affecting limit switches, with return of handle to original position.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install grilles and operating equipment complete with necessary hardware, according to Shop Drawings, manufacturer's written instructions, and as specified.

3.2 ADJUSTING

A. Lubricate bearings and sliding parts; adjust grilles to operate easily, free from warp, twist, or distortion and fitting tight for entire perimeter.

3.3 DEMONSTRATION

A. Startup Services: Engage a factory-authorized service representative to perform startup services and to train Owner's maintenance personnel as specified below.

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
2. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance, and procedures for testing and resetting release devices.
3. Review data in the maintenance manuals. Refer to Division 1 Section "Contract Closeout."
4. Review data in the maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
5. Schedule training with Owner with at least 7 days' advance notice.

END OF SECTION 08 330

SECTION 08 410 - ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Related sections:
1. Section 08462: Automatic Sliding Doors.
2. Section 08520: Aluminum Windows.
3. Section 08710: Door Hardware.
4. Section 08800: Glazing.

1.2 REFERENCES

A. Standards of the following as referenced:
1. American Architectural Manufacturers Association (AAMA).
2. Aluminum Association (AA).
3. American Iron and Steel Institute (AISI).
4. American National Standards Institute (ANSI).
5. American Welding Society (AWS).
6. ASTM.
7. Structural Steel Painting Council (SSPC).

B. Industry standards:
1. AA: DAF-45-80; *Designation System for Aluminum Finishes*; 7th edition.
2. AAMA:
a) 501: *Methods of Test for Metal Curtain Walls*, 1983 edition.
b) 501.2: *Field Check of Metal Curtain Walls for Water Leakage*, 1983 edition.
c) 605.2-92: *Voluntary Specification for High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels.*
d). MCWM-1: *Metal Curtain Wall Manual*, 1989 edition.
3. SSPC: *Systems and Specifications*, Volume 2, September 1989.

1.3 SYSTEM DESCRIPTION

A. Design requirements:
1. Design completed system to withstand wind pressure loads normal to wall plane indicated.
a) Exterior walls; follow requirements of local code if more stringent:
b) Positive pressure: 25 PSF, minimum.
c) Negative pressure: 13 PSF, minimum.
d) Maximum allowable deflection; follow requirements of local code if more stringent: L/175 in any member when tested in accord with ASTM E330-84 with allowable stress safety factor of 1.65, minimum.
2. Provide for thermal movement caused by 180%F surface temperature range, without causing buckling stresses on glass, joint seal failure, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or detrimental effects.

B. Performance requirements for glazed storefronts systems framing without doors or operable walls:
   1. Static pressure air infiltration: Completed storefronts systems shall have 0.06 CFM maximum allowable infiltration when tested in accord with ASTM E283-84 at 1.57 PSF differential static pressure.
   2. Static pressure water infiltration: No uncontrolled water other than condensation on indoor face of any component when tested in accord with ASTM E331-86 at test pressure equal to 10% of positive wind pressure design but not less than 6.24 PSF. Contain water penetrating storefronts system within system by gutters; drain to exterior through weep holes. No uncontrolled water infiltration is allowable.

1.4 SUBMITTALS

A. Product data:
   1. Complete product data; indicate system or systems used.
   2. *"Manufacturer's Safety Data Sheets"*, (M.S.D.S.), for materials.

B. Shop drawings:
   1. Indicate elevations; with sections and details at full scale. Include glass and metal thicknesses, joining details, field connections, anchorage, provisions for expansion, fastening and sealing methods, reinforcement, metal finishes, and glazing accessories. Indicate compliance with specified design criteria.
   2. Shop drawings bearing professional engineer seal, licensed to practice in State of Georgia.

C. Samples:
   1. Minimum 3" by 5" samples on actual substrates indicating full color range expected in finished work. Furnish separate finish samples for each aluminum temper; indicate temper on sample.
   2. 6" by 6" door corner bottom indicating construction and color selected.
   3. 6" by 6" corner storefronts systems indicating construction and color selected.

D. Quality control submittals:
   1. Design data: Indicate compliance with criteria bearing professional engineer seal, licensed to practice in State of Georgia.
   2. Test reports: Certified copies of test reports on specified wall systems and components performance on request in lieu of conducting repeat tests.
   3. Certificates: Indicate on shop drawings or by letter prior to shop drawings submission stating authorized representative of selected glass manufacturer has reviewed and approved details, including glass bite, clearances, and glazing methods.

E. Contract closeout submittals:
   1. Operation and maintenance data: Maintenance procedures for care and cleaning of entrances and storefronts systems materials.
   2. Warranty: Executed warranties; signed by manufacturer authorized individual and installer.

1.5 QUALITY ASSURANCE

A. Qualifications, installer: Completed five projects, minimum, of similar magnitude using systems similar to systems specified below in last three years. Furnish reference list of completed projects for review and verification.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Storage and protection:
   1. Store material in location and manner to avoid damage. Stack to prevent bending.
   2. Store aluminum materials and components in clean, dry location, away from uncured concrete and masonry. Cover with waterproof breathable cover allowing air circulation.

1.7 WARRANTY

A. Special warranty:
   1. Door hardware: One year period.
   2. Warrant construction activities in this section for watertightness for two year period beginning at Date of Substantial Completion. Include corrective procedures at no additional cost during warranty period.
   3. Coordinate warranty with construction activities specified in Glazing Section.
   4. Coordinate and co-warranty with warranty requirements specified in Glazing Section.
   5. Finish: Manufacturer's standard finish warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. EFCO Corporation “System 403 Thermal Flush-Glazed Screw Spline Storefront System” used as standard of quality. Other manufacturers requesting approval to bid their product as an equal must submit the required information fifteen days prior to close of bidding in accordance with Section 01640- Product Requirements.

2.2 MATERIALS

A. Extrusions: ASTM B221-90, 6063-T5 aluminum alloy and temper.

B. Aluminum sheet: ASTM B209-90, 5005-H34 aluminum alloy, minimum 0.050" thickness.

C. Anodized finish: AA M12C22A34, Architectural Class II, medium bronze electrolitically deposited color and clear composite top coating.

D. Accessories:
   1. Fasteners:
      a) Concealed: Zinc plated steel.
      b) Exposed: Hardened aluminum alloys or AISI 300 series stainless steel; countersunk; match aluminum finish color.

2. Storefront sealant: Non-skinning type; AAMA 803.3-85, color matching finish.
3. Setting blocks, edge blocks, and spacers; ASTM C864-79; Shore durometer hardness as follows:
   a) Setting blocks: 85 Shore A durometer hardness.
   b) Edge blocks: 65 Shore A durometer hardness.
   c) Spacers: 50 Shore A durometer hardness.
4. Other items specified in respective component system.

2.3 MANUFACTURED UNITS

A. Storefront framing system:
   1. System: EFCO, Corp.; System # 403.
   2. Framing characteristics:
      a) System description: Center rabbet, exterior flush glazed; jambs and vertical mullions continuous; head, sill, and intermediate horizontals attached by screw spline joinery; thermally improved using debridging material as thermal barrier..
      b) Member size: 2" by 6”
      c) Manufacturer's standard extruded aluminum expansion mullions, 0-15% hinged mullions, 90% corner posts, flexible corner posts, three way corner posts, 93-170% flexible corner posts, entrance door framing, and indicated shapes.
      d) Glazing: Indicated in Glazing Section.
      e) Glazing pocket depth: Required for indicated glazing.
      f) Glazing gaskets: Manufacturer's standard EPDM glazing gaskets for specified system.
      g) Applied Accent Caps and Trim: Manufacturer's standard extruded aluminum mullions, applied to window units.

B. Entrances:
   1. Medium stile design:
      a) Acceptable product: EFCO, Corp.; Series D502 Medium Stile ThermaStile Doors.
      b) Nominal dimensions: 5" wide stiles, 5-11/16" wide top rail, and 8-3/16" bottom rail; 2" depth.
   2. Door construction: Fabricate using extruded aluminum sections with door corners joined by concealed reinforcement secured with bolts, screws, and sigma deep penetration welding.
   3. Glazing stops:
      a) Snap-in stops with EPDM glazing gaskets to prevent water infiltration; square style.
      b) Provide for glazing specified in Glazing Section.
   4. Doors with drip cap at head and bottom rail to prevent water infiltration.
   5. Adjustment: Equip doors with adjustable mechanism located in top rail near lock stile to provide minor clearance adjustments after installation.
   1. Weatherstripping: Manufacturer's standard pile type in replaceable rabbets for stiles and rails.
   2. Glass is to be 1” insulated tempered glass units utilizing warm edge technology.
   3. All exterior aluminum shall be separated from interior aluminum by a rigid, structural thermal barrier.

C. Door hardware, each leaf:
   a) Hinging shall be manufacturers standard continuous gear hinge.
   b) Flush Bolts shall be manufacturers standard type.
   c) See Hardware Schedule for remaining hardware. Hardware for (check with entrance door manufacturer for compatibility with doors) entrance doors shall be sent to the door manufacturer for application. The finish hardware supplier shall be responsible for furnishing physical hardware, and templates of all hardware, to the entrance door manufacturer prior to fabrication, and for coordinating hardware delivery requirements with the hardware manufacturer.

2.4 FABRICATION

A. Shop assembly:
   a) Fabricate and assemble framing with joints only at intersections of members with uniform hairline connections; rigidly secure.
   b) Drill and cut to template for hardware. Reinforce frames and door stiles and rails to receive hardware in accord with entrance manufacturer's product data.
   c) Weld in accord with AWS recommendations or methods recommended by selected manufacturer. Conceal welds from view.

B. Shop finishing: Prepare surfaces for specified finish; apply in accord with AA requirements for anodized coating to obtain specified finish and uniform color.

C. Tolerances:
   a) Material cuts: Square to 1/32" off square, maximum, over largest dimension; proportionate amount of 1/32" on other two dimensions.
   b) Maximum offset in alignment between two consecutive members in line, end to end: 1/64".
   c) Maximum offset between framing members at glazing pocket corners: 1/64".
   d) Joints between adjacent members in same assembly: Hairline and square to adjacent member.
   e) Variation in squaring diagonals for doors and fabricated assemblies: 1/16".
   f) Flatness for doors and fabricated assemblies: Å1/16" off neutral plane.

2.5 SOURCE QUALITY CONTROL

A. Inspection: Inspect areas around welds; reject items showing welding bloom or discoloration on finish or material distortion.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of conditions: Verify locations of preset anchorages and block-outs have been installed in accord with reviewed shop drawings.

3.2 PREPARATION

A. Surface protection: Protect aluminum surfaces from contact with lime, mortar, cement, acids, and harmful surfaces.

3.3 INSTALLATION

A. General:
   1. Install entrances and storefronts systems in accord with manufacturer's product data and reviewed shop drawings, plumb, level, and true to line, within specified tolerances.
   2. Protect aluminum in contact with masonry, steel, concrete, or dissimilar materials from contact using neoprene gaskets or apply mastic in accord with SSPC-Paint 12.
      a) Shim and brace work plumb, level, and in designated location, before anchoring to structure.
      b) Install sill flashing at exterior storefronts system. Extend flashing continuous with lapped joints; set in two continuous beads of butyl sealant full width.
      c) Verify, during installation, storefronts system allows water entering system to be collected in gutters and weeped to exterior. Verify weep holes are open; and metal to metal joints are tightly sealed.
      d) Locate expansion mullions where indicated on reviewed shop drawings.
      e) seal metal to metal storefronts system joints using storefront sealant. Install in accord with Joint Sealants Section; take care not to seal system weeps.

B. Entrances: Install doors in frames for uniform contact, to operate throughout full swing without binding or sticking. Set thresholds in two continuous beads of butyl sealant full width of threshold.

C. Sealants: Caulk juncture perimeter of system frame and adjoining material at jambs and head with sealant specified in Joint Sealants Section.

D. Repair or replace work damaged or stained by subsequent construction activities. Clean exposed aluminum surfaces at completion of work and not more than 48 hours prior to Date of Substantial Completion in accord with AAMA 609.1-85.

E. Tolerances:
   1. Material cuts: Square to 3/64" off square, maximum, over largest dimension; proportionate amount of 3/64" on other two dimensions.
   2. Maximum variation from plumb, level, or designated position: 1/8" in 12'-0", not exceeding 1/4" in total run.
   3. Maximum offset in alignment between two consecutive members in line, end to end: 1/16".
   4. Maximum offset between framing members at glazing pocket corners: 1/32".

5. Joints between adjacent members in same assembly: Hairline and square to adjacent member.
6. Variation in squaring diagonals for assemblies: 1/8".

END OF SECTION 08 410

SECTION 08 462 - AUTOMATIC SLIDING DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum sliding doors and frames.

B. Automatic door operators, actuators, and safeties.

C. Sidelights and transoms.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-in-Place Concrete: Recess in concrete slab for track at sidelight areas.

B. Section 16155 - Equipment Wiring: 115 VAC, single-phase wiring in conduit between operator enclosure and building power supply and low voltage wiring between enclosure and actuators and safeties.

1.3 REFERENCES

A. BHMA A156.10 - American National Standard for Power Operated Pedestrian Doors; 1991.

B. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; 1986.

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's catalog data, detail sheets, and specifications.

C. Shop Drawings: Prepared specifically for this project; show dimensions of doors, operators, and interface with other products.

D. Samples: Color charts or samples, for selection of metal finishes.

E. Operating and Maintenance Data: Operating and maintenance instructions, parts lists, and wiring diagrams.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Factory-trained, with minimum 3 years experience.

1.6 WARRANTY

A. See Section 01700 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty for roller track for five years from date of completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturer: Provide products made by Dor-O-Matic, 7350 West Wilson Avenue, Harwood Heights, IL 60656-4786. ASD. Tel: (708) 867-7400 or (800) 543-4635. Fax: (708) 867 0291 or equal.

B. Substitutions: See Section 01340 Submittals and Substitutions.

C. Provide all door operators from a single manufacturer.

2.2 DOORS AND FRAMES

A. Automatic Sliding Doors: Heavy duty anodized extruded aluminum header and jambs, with interlocked sections and thru-rod bolted connections; complete with doors, sidelights, transom, and all hardware and accessories; complying with BHMA A156.10 and UL 325.
   1. Type: Bi-parting, two sliding leaves.
   2. Doors sliding on outside of fixed sidelights.
   3. Actuators: Motion detector, both sides.
   4. Safety: Overhead-mounted infrared presence detector and safety beams in door opening.
   5. Finish: Anodized Dark Bronze.
   6. No exposed fasteners.

B. Header: Completely enclosing track, operator, and belt drive, with anti-riser stops.
   1. Track: 1/2 inch wide stainless steel-capped roller track.
   2. Header Dimensions: 6-3/4 inches high by 4 inches wide; full width of rough opening.
   3. Provide access door on bottom of enclosure for access to controls and removable components without removal of door or operator.

C. Doors: Sliding panels with emergency swing out operation (breakaway) to 90 degrees at any position in opening cycle.
   1. Door Panels: Glazed extruded anodized aluminum, with thru-bolted connections, matching header and jambs.
      a. Glass: 1 inch thick sealed insulating units, clear, tempered.
      b. Rail Height: 5 inches; top rails 3-1/2 inches.
      c. Meeting stile weatherstripping: Dual nylon pile.
      d. Overlapping stiles of doors and sidelights: Single nylon pile weatherstripping.
   2. Door Suspension: 1-3/4 inch diameter nylon rollers, mounted over centerline of door, with steel corner support at hinge stile pivot to prevent sag.
   3. Locking: Manual lock with interior thumbturn release.
   4. Latching of Breakaway Panels: Magnetic latches.
   5. Breakaway Closer: Provide mechanical spring closer to return swing out panel to normal sliding position.
   6. Limit Arm: Provide limit arm to prevent swinging to more than 90 degrees.
   7. Weatherstripping:
      a. Bottom: Adjustable nylon sweeps.
      b. Carrier and header contact surfaces: Single weatherstripping.

D. Sidelights: Same construction as doors.
   1. Doors Sliding on Outside of Sidelight: Provide fixed sidelights; provide doors with side guides using roller bearing pivot assemblies, within sidelight area only.

2. Locking function: When doors are closed and locked, sidelights will not swing out.
3. Glass: Same as for doors.

E. Door Operators: Completely electro-mechanical, DC motor powered, with positive pulley and cog belt drive in both opening and closing cycles; comply with BHMA A156.10.
1. Provide microprocessor control; do not use rotary cam mechanisms or door position switches in header.
a. Adjustable opening and closing speed.
b. Hold-open time adjustable from 1 to 30 seconds.
c. Adjustable safety reverse: If object is encountered during closing cycle, re-open door; if object is encountered during opening cycle (in sidelight area), stop door and slowly reclose.
2. Provide positive backcheck and latching by pre-set forces that drive the door fully open and closed.
3. "On-Off-Hold Open" switch: Three-position toggle or rocker type.
4. Energy Conservation Switch: Manual switch that reduces door opening width.
5. Service conditions: Satisfactory operation between minus 30 degrees F and 160 degrees F.
6. Power supply required: 115 VAC.

2.3 ACTUATORS

A. Motion Detectors: Dor-O-Matic "Astro-Scan".
1. Operation: Detect movement within adjustable zone near door and activate operator; deactivate operator upon no movement.
2. Adjustable sensitivity and time delay.
3. Housing: Dark Bronze anodized aluminum.
4. Lens: Black Lexan, screwed on; sealed to provide weather- and dust-proofing.
5. Mounting: Flush against header/wall.
6. Operating unit: Gimbal-mounted oscillator allowing pattern adjustment.
7. Electronics: Removable printed circuit board with gold-plated contacts; unaffected by radio frequency interference, normal police, fire, and ambulance frequencies, and other two-way radio frequencies; designed to eliminate line noise and surge current.
8. Service conditions: Satisfactory operation between minus 30 degrees F and 160 degrees F; unaffected by humidity or moisture.

B. Overhead-Mounted Infrared Presence Detector and Safety Beams: Dor-O-Matic "Look-See" system with 2 safety beams, interconnected with actuators.
1. Housing: Mounted in door frame (header).
2. Detection (safety) zone: Elliptical shaped, full width of door opening by 30 inches deep, centered on door opening.
3. Controls: Microprocessor.
a. Detector or Safety Beam Inoperative: Prevent open door from closing.
b. Object detected in safety zone during door closing: Re-open door.
c. Object detected in safety zone, door open: Continue to hold door open.

C. Signs: Provide signs complying with ANSI A156.10 and applicable codes; white letters on red background.
1. Outside: "AUTOMATIC SLIDING DOOR."
2. Inside (push side for breakaway): "IN EMERGENCY PUSH TO OPEN."

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions; comply with BHMA A156.10.

B. Grout recess around track.

C. Verify that electrical connections are made correctly.

3.2 ADJUST AND CLEAN

A. Adjust doors and operators for proper operation, without binding or scraping and without excessive noise.

END OF SECTION 08 462

SECTION 08 710 - BUILDERS HARDWARE

PART 1 GENERAL

1.01 SUMMARY

A. The work required under this section consists of furnishing hardware and supervising the installation of hardware and related items that are necessary to complete the work as indicated on the drawings and described in this section.

B. Related work described in other sections:
1. Hollow metal work
2. Wood doors
3. Aluminum doors and frames
4. Carpentry
5. Finishes

1.02 REFERENCES

A. State of Georgia Minimum Fire Safety Standards 120-3-3; January 2000

B. Accessibility Codes for Buildings & Facilities 120-3-20; July, 1997

C. ANSI A117.1-1986 - Specifications for making buildings and facilities usable by physically handicapped people

D. AWI - Architectural Woodwork Institute

E. BHMA - Builders' Hardware Manufacturers Association

F. DHI - Door and Hardware Institute

G. NAAMM - National Association of Architectural Metal Manufacturers

H. NFPA - National Fire Protection Association
1. NFPA 80 - Fire Doors and Windows 1995
2. NFPA 101 - Life Safety Code 2000
3. NFPA 252 - Fire Tests of Door Assemblies
4. NFPA 105 - Smoke and Draft Control Door Assemblies[1]

I. UL - Underwriters' Laboratories
1. UL10C- Fire Test of Door Assemblies
2. UL305 - Panic Hardware

J. Standard Building Code-IBC-2000: January 1, 2002

1.03 SUBMITTALS

A. Hardware schedule: Submit a complete schedule of hardware. Using the format of this specification, indicate type, number location, and finish of each item. Include manufacturer's name and model description, fastening devices, and complete keying schedule. Reference architect's door designation, including room identifier location for the opening involved. Submit six (6) copies.

B. Provide a cross-reference between door numbers and specification hardware heading numbers.

C. Physical samples: When requested, submit physical samples of each item of hardware and show manufacturer's name, model, and finish.

D. Templates: Furnish templates and approved schedule to each related manufacturer of equipment that requires same for the fabrication of their material.

1.04 QUALITY ASSURANCE

A. Provide hardware in compliance with the local building code requirements. Comply with NFPA 101 Life Safety Code and ANSI A117.1 where applicable.

B. Provide hardware for fire rated openings in accordance with NFPA 80, Fire Doors and Windows and NFPA 105, Smoke and Draft Control Door Assemblies.

C. Provide the services of a finish hardware supplier who has been furnishing hardware in the project's vicinity for a period of not less than two (2) years and is experienced hardware consultant (AHC). The hardware supplier's office is to be located within a fifty (50) square mile area from the job site. The consultant shall be available during the course of the work to the architect, contractor, and owner.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver finish hardware to project site in the manufacturer's protective packaging. All items are to be marked to indicate door opening number, hardware schedule number, or other identifying marks.

B. Store hardware in a secure lock-up area that is dry and lighted.

1.06 WARRANTY

A. Warrant door closers against failure due to defective materials and workmanship for a period of ten (10) years beginning at date of substantial completion. Closers judged defective during this period shall be replaced or repaired at no cost to the owner.

B. Warrant exit devices against failure due to defects in material or workmanship for a period of five (5) years.

C. All other warranties and bonds are to be in accordance with Division 1, Section 01700 - Contract Closeout.

PART 2 PRODUCTS

2.01 FINISH

A. Finish, unless otherwise indicated, shall be brushed stainless steel, 630 (US32D). Items not available in 630 are to be 626 finish. Finish for Aluminum Doors to be 613 (US10-B)

B. Door closers shall be spray-painted for finish to match adjacent hardware.

2.02 KEYING

A. All cylinders shall be interchangeable core, keyed to the existing Sargent GA-GM key system or Corbin 59D1-59D2 as directed by Fulton County. All cylinders shall have brass Construction Cores.

B. Provide the following number of keys:
1. Four (4) Change Keys per lock
2. Six (6) Construction Master Keys
3. Six (6) Master Keys
4. Two (2) Control Keys

2.03 HINGES

A. Types, materials, sizes, and finishes as noted in the Hardware Schedule. Steel hinges shall be prime coated for use on hollow metal doors with a zinc plate base, bonderized in addition to the final finish. Use security studs in secure areas with stainless steel pins, non-rising.

B. Concealed bearings are not to be installed in hinges before electroplating the hinge. If frozen bearings are found, replace the complete shipment.

C. Manufacturers whose product meets the criteria of this specification and are acceptable:

1. Hager
2. McKinney
3. Stanley

2.04 CONTINUOUS HINGES

A. Continuous hinges shall be full height, pin and barrel hinges, providing full height door support. Material shall be stainless steel with a .25 diameter stainless steel pin. Each knuckle shall be 2" and shall include a nylon bearing at each separation for quiet, smooth, self-lubricated operation. All adjustable hinges and edge guards are to be provided with the left hand Adjusta-Stud. Provide three (3) left hand taps to be turned over to the owner.

B. Manufacturers whose product meets the criteria of this specification are acceptable:

1. Markar Products - 300 Series
2. McKinney-300 Series
3. Zero-

2.05 LOCKSETS AND LATCHES

A. All locksets are to be mortise type ANSI A156.13 1987 Grade 1 Operational Grade 2 Security, ANSI/ASTMF476-76 Grade 20. The lock case is to be steel with corrosion protection. The back set is to be 2-3/4". The latchbolt throw is to be 3/4". The deadbolt throw is to be 1". The armored front is to be adjustable 1/8" in 2" for door bevel. The levers are to be thru-bolted through the door and locked into each side. Surface mounted or single side mounted levers are not acceptable.

B. All locksets and latches are to be the product of the same manufacturer. All lever trim is to be cast solid.

C. Manufacturers whose product meets the criteria of this specification and are acceptable:

1. Corbin ML2000 Series LSA Design
2. Sargent 8200 Series LNJ Design
3. Best 35H Series 3H Design

2.06 EXIT DEVICES

A. Panic exit devices must be listed with the Underwriter's Laboratories, Inc. for Accident Hazard. Fire exit devices must be available with UL Label for a three (3) hour fire rating for the specified door opening size.

B. All exit devices must be reversible. All exit devices must have 3/4" throw latch bolts. All exit devices must have components fastened with screws for ease of maintenance. Rivets are not acceptable as fasteners. All exit devices must be Stainless Steel. Aluminum or plastic exposed surfaces are not acceptable. All exit device lever trim must be cast bronze with vandal resistant feature.

C. Manufacturers whose product meets the criteria of this specification are acceptable:
1. Precision Apex 2000 Series
2. Von Duprin - 98 Series

2.07 CLOSERS AND DOOR CONTROL DEVICES

A. Size of units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size, depending on size of door, exposure to weather, and anticipated frequency of use. Compliance with ADA's 5 lbs. resistance to opening for interior, non-rated doors and 8 lbs. resistance to opening for fire-rated and exterior openings.

B. Access-free manual closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units which comply with ANSI A117.1 - Provisions for Door Opening Force and Delayed Action Closed.

C. Closers are to be fully hydraulic, rack and pinion action with high strength cast cylinders, and one piece forged steel pistons. Hydraulic fluid to be of a type that requires no seasonal adjustments for temperatures from 120º F (49º C) to -30º F. Hydraulic regulation to be controlled by tamperproof, non-critical screw valves. All closers shall have separate adjustments for back check, general speed, and latching speed.

D. Manufacturers whose product meets the criteria of this specification and are acceptable:
1. Ryobi - D-4550 Series
2. LCN - 4010 Series

3. Rixson 2020 Series

2.08 OVERHEAD STOPS AND HOLDERS

A. All overhead stops and holders to be furnished with 300 series stainless steel substances for operational durability and corrosion resistance.

B. Concealed units are to be supplied with adjustable jamb brackets to provide adjustment for degree of hold open or stop angle after installation.

C. Manufacturers whose product meets the criteria of this specification and are acceptable:
1. Glynn-Johnson
2. A.B.H.
3. Sargent

2.09 BOLTS

A. Flush bolts shall be 1" x 6-3/4" brass, rectangular front, per lengths indicated with 3/4" throw. Furnish bottom strike and top strike plate.

B. Bolts and accessories for use on fire-rated doors shall be Underwriter's Laboratories Listed.

C. Manufacturers whose product meets the criteria of this specification and are acceptable:
1. Rockwood
2. Glynn-Johnson
3. Trimco

2.10 FLAT GOODS

A. Where specified in the hardware sets, door protection plates shall be constructed of stainless steel to meet ANSI 156.6 requirements for .050" thickness.

B. Plates are to be beveled three sides with countersunk holes, staggered equal distances apart, and applied with flat-head screws.

C. Kick plates are to be mounted on the push side of the door and are to be 8" x 2" LDW. Mop plates are to be mounted on the pull side of the door and are to be 8" x 1" LDW.

D. Manufacturers whose product meets the criteria of this specification and are acceptable:
1. Ives
2. Rockwood
3. Trimco

2.11 THRESHOLDS, WEATHER-STRIP/SOUND SEAL, RAIN DRIPS, AND DOOR BOTTOMS

A. Types as indicated in Hardware Schedule.

B. Manufacturers whose product meets the criteria of this specification and are acceptable:
1. National Guard
2. Pemko
3. Granite State Casting

2.12 POCKET DOOR HARDWARE & FRAME

A. Pocket door hardware and frame are to be furnished by the same manufacturer. A complete package is to be furnished. The hardware is to conform to ANSI A156.14 type D8681. The frame is to conform to ANSI A156.14 type D8671.

B. Manufacturers whose product meets the criteria of this specification and are acceptable:

1. Stanley 735/40-3925R/40
2. Johnson 1500
3. Sterling 1630

2.13 KEY CABINET

A. Provide a key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet.

B. All keys are to be installed, cross-indexed, and tagged by the lock manufacturer. The completed cabinet is to be delivered as directed by the Project Architect.

C. Provide complete keying cross-index system that is set up by lock manufacturer. Place keys on markers and hooks in the cabinet as determined by the final key schedule.

D. Manufacturers whose product meets the criteria of this specification and are acceptable:
1. MMF
2. Telkee
3. Lund

PART 3 EXECUTION

3.01 PRELIMINARY

A. Receive, store in temporary bins, and be responsible for all finish hardware. Tag, index, and file all keys temporarily during construction.

B. Check all hardware upon arrival on job site against approved Finish Hardware Schedule. Function of hardware shall be examined against the job site conditions and interferences. If exceptions in these regards are found, notify Architect at once and retain subject hardware in its original packing carton. Adjustment and/or substitutions shall be made only as authorized by Architect.

3.02 INSTALLATION

A. Install hardware to doors as listed in the door schedule. Comply with Recommended Locations for Builders Hardware for Custom Steel Doors and Frames as published by the Door and Hardware Institute.

B. Application shall be by skilled workmen who work with proper equipment and shall be in accord with manufacturer's instructions, fit to work of others accurately, applied securely, and adjusted properly. Hardware let into work of others shall be neatly done from template and shall fit perfectly. Exercise care not to damage work of others.

C. Install finish hardware to template. Cut and fit substrate to avoid substrate damage or weakening. Cover cut-outs with hardware items. Mortise work to correct location and size without gouging, splintering, or causing irregularities in exposed finished work.

D. Where cutting and fitting is required on substrates to be painted or similarly finished, install, fit, and adjust hardware prior to finishing and then remove and place in original packaging. Reinstall hardware after finishing operation is completed.

E. Attach thresholds with flathead screws in lead expansion shields, spaced at 24" o/c maximum and symmetrical with the center of door opening. On cast thresholds where cast-on-anchors are used, apply utilizing an epoxy grout mixture.

F. The lock manufacturer shall install all keys in the key cabinet. The installation shall include the set up of the cross-indexing system. The completed cabinet is to be delivered to the Architect/Owner upon notification. The key cabinet with permanent keys installed is not to be delivered to the General Contractor.

3.03 CLEANING AND ADJUSTING

A. At the time of hardware installation, adjust each hardware item to perform function intended. Lubricate moving parts with lubricant acceptable to hardware manufacturer.
B. Prior to "Date of Substantial Completion" readjust and relubricate hardware. Repair or replace defective materials. Clean hardware as recommended by manufacturer to remove dust and stains.

3.04 FASTENINGS

A. All exposed screws shall be Phillips head, finished to match item, and sized to suit job requirements.

B. Surface applied items such as closers exit devices and overhead controls shall be applied with sex nut and bolt assemblies.

C. All finish hardware shall be installed with the fasteners furnished by the manufacturer. Warranty and/or fire label will be void on finish hardware items installed with unapproved fasteners.

3.05 OPERATION

A. After installation, all templates, installation instructions, as-built wiring diagrams, and special details are to be placed in a properly identified binder. This binder and all special tools are to be turned over to the Architect at Final Acceptance of the project.

B. After Final Acceptance, the hardware supplier shall instruct the Owner's designated personnel in the proper operation, adjustment, and maintenance of hardware and finishes.

3.06 COORDINATION

A. Coordinate finish hardware installation with other trades to ensure proper installation and function for a complete operating system.

3.07 HARDWARE SCHEDULE

Heading 1
Doors 1-C1A, 1-C1B
Each door to have:

2	Continuous Hinges	FM300 x MK-PC1
1	Exit Device	98NL x Less Pull x SNB x 313AM
1	Exit Device	98EO x SNB x 313AN
2	Cylinders	3083-178 x 613
1	Removable Mullion	KR4954F x 313AN
2	Closers	4111 x EDA x 4110-18 x 4110-30 x 4110-60 x 690
2	Floor Stops	1209
2	Door Bottoms	211 AV
1	Threshold	GS206ADA x COA x 1”GFE

Heading 2
Doors 1C2-A
Each door to have:

3	Hinges	CB179 4.5 x 4.5 x 652
1	Lockset	ML2065 LSA x CT6 x 630
1	Closer	4111 x EDA x SBN x 689
1	Armor Plate	34” x 2”LDW x .050 x B3E x 630
1	Floor Stop	1231 x 626
1	Closers	D-4550 x EDA x SN x 690 x P45-180
3	Silencers	1229

Heading 3
Doors 1-C2B
Each door to have:

1	Continuous Hinge	HG-305 x AS x 630
1	Lockset	ML2042 x LSA x CT6 x 630
1	Closer	4111 SH-CUSH x SNB x 689
1	Armor Plate	34” x 2”LDW x .050 x B3E x 630
1	Floor Stop	1209
1	Door Bottom	211 APK
1	Threshold	GS206ADA x COA x 1”GFE
1 Set	Weather-strip	2891 APK Head, 290 APK Jambs
3	Silencers	1229

Heading 4
Doors 1-101A
Each door to have:

1	Cylinder	1080 x 613

Balance of Hardware by Door Manufacturer

Heading 5
Doors 1-101B, 1-117A, 1-117B
Each door to have:

All Hardware by Door Manufacturer

Heading 6
Doors 1-102A, 1-103A

Each door to have:

1 set	Pocket Door Frame & Hardware	PDF 250N-00
1	Pull	PD 250-61 x 626

Heading 7
Doors 1-104A
Each door to have:

6	Hinges	CB179 4.5 x 4.5 x 652
2	Flush Bolts	3916 x 3913 x 626
1	Dust Proof Strike	3910 x 626
1	Lockset	ML2048 x LSA x CT6 x 630
2	Closers	4111 x EDA x SNB x 689
2	Kickplate	8”x 1”LDW x .050 x B3E x 630
2	Wall Stop & Holders	1254 x 626
2	Silencers	1229

Heading 8
Doors 1-104B, 104C
Each door to have:

6	Hinges	CB179 4.5 x 4.5 x 652
2	Exit Devices	9827L-F x 994L-03 x LBR x SNB x 630
2	Cylinders	3080-178 x 626
2	Closers	4010 x T x SNB x 689
1	Kickplate	8”x 2”LDW x .050 x B3E x 630
2	Magnetic Wall Holders	FM998 x 24v dc x AL x 991002 Back Box
2	Silencers	1229

Heading 9
Doors 1-105A, 1-107A
Each door to have:

3	Hinges	CB179 4.5 x 4.5 x 652
1	Push Plate	1809-4 x 630
1	Pull Plate	1809-4 x 1194-2 x 630
1	Closer	4010 x T x SNB x 689
1	Kickplate	8”x 2”LDW x .050 x B3E x 630
1	Mopplate	8”x 1”LDW x .050 x B3E x 630
1	Floor Stop	1231 x 630

Heading 10
Doors 1-106A, 1-126A
Each door to have:

3	Hinges	CB179 4.5 x 4.5 x 652
1	Lockset	ML2057 LSA x CT6 x 630
1	Closer	4111 x CUSH x SNB x 689
1	Kickplate	8”x 2”LDW x .050 x B3E x 630
3	Silencers	1229

Heading 11
Doors 1-108A, 1-109A, 1-110A, 1-114A, 1-115A, 1-127A, 1-128A, 1-129A, 1-130A, 1-131A
Each door to have:

3	Hinges	CB179 4.5 x 4.5 x 652
1	Lockset	ML2055 LSA x CT6 x 630
1	Kickplate	8”x 2”LDW x .050 x B3E x 630
1	Floor Stop	1231 x 626
3	Silencers	1229

Heading 12
Doors 1-111A, 1-112A, 1-113A
Each door to have:

3	Hinges	CB179 4.5 x 4.5 x 652
1	Lockset	ML2024 LSA x CT6 x 630
1	Closer	4010 x SNB x 689
1	Kickplate	8”x 2”LDW x .050 x B3E x 630
1	Floor Stop	1231 x 626
3	Silencers	1229

Heading 13
Doors 1-116A, 1-116C
Each door to have:

1	Continuous Hinge	FM300 x MK-PC1
1	Exit Device	98NL x Less Pull x SNB x 313AN
1	Cylinder	1080 x 613
1	Door Pull	1191-5 x 613 x E
1	Closer	4111 x EDA x 4110-18 x 4110-30 x 4110-60 x 690
1	Floor Stop	1209
1	Threshold	GS206ADA x COA x 1”GFE

Heading 15
Doors 1-120A
Each door to have:

1	Continuous Hinge	HG-305 x AS x 630
1	Lockset	ML2042 LSA x CT6 x 630
1	Closer	4111 x EDA x SNB x 689 x 180° Swing
1	Armor Plate	34” x 2”LDW x .050 x B3E x 630
1	Mopplate	8”x 1”LDW x .050 x B3E x 630
1	Wall Stop & Holder	1254 x 626
3	Silencers	1229

Heading 16
Doors 1-124A, 1-125A
Each door to have:

3	Hinges	CB179 4.5 x 4.5 x 652
1	Privacy Set	ML2030 x LSA x 630
1	Indicator	5004-1 x 630
1	Kickplate	8”x 2”LDW x .050 x B3E x 630
1	Mopplate	8”x 1”LDW x .050 x B3E x 630
1	Wall Stop	1270 CV x 626
1	Threshold	173A
1	Door Bottom	434 ANL
1 Set	Sound Seal	379 CR
3	Silencers	1229

Heading 17
Doors 1-C3A
Each door to have:

6	Hinges	CB179 4.5 x 4.5 x 652
2	Push Plates	1001-11 (8”x 16”) x 630
2	Pull Plates	1018-3B (4”x 16”) x 630
2	Closers	4010 x T x H90° x 689
2	Kickplates	8”x 2”LDW x .050 x B3E x 630
2	Floor Stops	1231 x 626
2	Silencers	1229

Heading 18
Doors 1-121A
Each door to have:

6	Hinges	CB191 x 4.5 x 4.5 x Security Stud x 630
2	Surface Bolts	3923-12" x 626
1	Lockset	L1021 (C, R, B) x 626 x Construction Core
1	Permanent Core	CT6 x 626
1	Edge Guard	EG-T-308 x AS x 630
2	Overhead Controls	4-226 x SNB x 630
1	Door Shoe	2221 APK
1	Threshold	GS306ADA x COA x 1"GFE
1	Rain Drip	346C
2	Silencers	1229

Heading 19
Doors 1-123A
Each door to have:

6	Hinges	CB191 x 4.5 x 4.5 x Security Stud x 630
2	Surface Bolts	3923-12" x 626
1	Lockset	ML2022 LSA x CT6 x 630
1	Edge Guard	EG-T-308 x AS x 630
2	Overhead Controls	4-226 x SNB x 630
1	Door Shoe	2221 APK
1	Threshold	GS306ADA x COA x 1"GFE
1	Rain Drip	346C
2	Silencers	1229

Heading 20
Miscellaneous

3	Left Hand Taps	MT-LHT 3/8-16
1	Adjusting Wrench	BP-250-99
1	Key Cabinet	201-8120-03
1	Set up of Key Cabinet	By Lockset Manufacturer
1	Installation of Permanent Cylinders	By Lockset Manufacturer

END OF SECTION 08 710

SECTION 08 800 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Doors.
   2. Storefront framing.

B. Related Sections include the following:
   1. Division 8 Section "Mirrored Glass."

1.3 DEFINITIONS

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

D. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: For the following products, in the form of 12-inch- (300-mm-) square Samples for glass.
   1. Insulating glass for each designation indicated.

C. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

   1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

D. Qualification Data: For installers.

E. Product Test Reports: For each of the following types of glazing products:
   1. Insulating glass.

F. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.

C. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

D. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.

   1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
   2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

E. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:

   1. Insulating Glass Certification Council.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

1.9 WARRANTY

A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 GLASS PRODUCTS

A. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
4. Sealing System: Dual seal, with primary and secondary sealants as follows:

    a. Manufacturer's standard sealants.

5. Spacer Specifications: Manufacturer's standard spacer material and construction.

2.3 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As indicated by manufacturer's designations.

B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Single-Component Neutral-Curing Silicone Glazing Sealants

    a. Products:

        1) Dow Corning Corporation; 790.
        2) GE Silicones; SilPruf LM SCS2700.
        3) Tremco; Spectrem 1 (Basic).
        4) GE Silicones; SilPruf SCS2000.
        5) Pecora Corporation; 864.
        6) Pecora Corporation; 890.
        7) Polymeric Systems Inc.; PSI-641.
        8) Sonneborn, Div. of ChemRex, Inc.; Omniseal.

9) Tremco; Spectrem 3.

b. Type and Grade: S (single component) and NS (nonsag).
c. Class: 100/50.
d. Use Related to Exposure: NT (nontraffic).
e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.

2.4 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.5 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.

C. Grind smooth and polish exposed glass edges and corners.

2.6 INSULATING-GLASS UNITS

A. Passive Solar Low-E Insulating-Glass Units:

1. Basis-of-Design Product: Solarban 60 (3) Azuria by PPG Industries

2. Products:

   a. Azuria.

3. Overall Unit Thickness and Thickness of Each Lite: 1 Inch.
4. Interspace Content: Air.
5. Outdoor Lite: Azuria.
   a. Kind HS (heat strengthened).

6. Indoor Lite: Class 1 (clear) float glass, sputter coated on third surface (3)

   a. Kind HS (heat strengthened).
7. Low-E-Coated Film: Solarban 60 Solar control Low-E by PPG Industries.

8. Visible Light Transmittance: 54 percent minimum.
9. Winter Nighttime U-Factor: 0.29 maximum.
10. Shading Coefficient: 0.36 maximum.
11. Solar Heat Gain Coefficient:.31 maximum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:

   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Presence and functioning of weep system.
   3. Minimum required face or edge clearances.
   4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm) as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.6 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system, unless otherwise indicated.

3.7 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 08 800

SECTION 10 155 - TOILET PARTITIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Provide Overhead-Braced and Floor-Anchored, Solid Phenolic Toilet Partitions and Privacy Screens as indicated on Drawings and as specified herein. Grab Bars provided under Toilet and Bath Accessories.

B. Related Sections include the following:

1. Division 5 Section “Metal Fabrications” for supports that attach units to overhead structural system.
2. Division 10 “Toilet and Bath Accessories” for toilet paper holders, grab bars, purse shelves, and similar accessories.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM).

1.4 SUBMITTALS

A. Product Data: Submit manufacturer’s detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fasteners, and accessories.

B. Shop Drawings: For fabrication and installation of Toilet Partition and Screen assemblies. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Initial Selection:

1. Submit manufacturer’s color chart with manufacturer’s full range of Standard Colors. Color shall be selected on a basis of four (4) stalls or more per color.
2. Submit certification that materials furnished comply with requirements specified.

D. Samples for Verification:

1. Submit 6” square Samples of each color and finish on same substrate used in work, for color verification after selections have been made.
2. Submit one (1) Sample of the following:
   a. Hardware (Complete)
   b. Pilaster (12” X 12”)
   c. Divider Panel (12” X 12”)
   d. Full High 16 Gauge Stainless Steel Mounting Bracket (57.5”)

e. 11 Gauge Stainless Steel Hinge

E. Maintenance Instructions: Provide manufacturer's printed Instructions for Maintenance of installed Work.

F. Written Warranty

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to Established Dimensions.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle compartments as recommended by manufacturer to protect from damage.

1.7 MANUFACTURER'S WARRANTY

A. Provide manufacturer's written warranty on its Panels, Pilasters and Doors for twenty five (25) years, against breakage, corrosion and delamination; to be replaced without charge, excluding labor.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

Basis of Design: COLUMBIA PARTITIONS SUPER HD – 9225, by PSISC, P.O. Box 181, Columbia, S.C. 29202, 803-252-3020, Fax: 803-256-7769.

2.2 MATERIALS

A. General: Provide material which has been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable. Solid Phenolic shall meet or exceed all requirements for Class "B" Flame Spread Rating calculated according to ASTM E-84-91A, and shall carry a UL Class "B" Fire Rating Certification.

B. Material shall be Solid Phenolic with a High Pressure Melamine matte finish surface made as an integral part of the core material. Laminated surfaces are not acceptable.
1. Doors – Minimum .75" (19 mm) Finished Thickness
2. Divider Panels – Minimum .75" (19 mm) Finished Thickness

3. Pilasters – Minimum .75" (19 mm) Finished Thickness

C. Colors: Refer to Finish Legend.

D. Pilaster Shoes: ASTM A 167, Type 302/304 Stainless Steel, minimum 4" high, 18 gauge, finished with #3 Directional Polish, attached with Stainless Steel Through Bolts.

E. Continuous Brackets: Full High (57.5") 16 Gauge Stainless Steel. Angle Brackets (1.5" x 1.5") shall be used to mount panel/pilaster to wall. 'U' Brackets shall be used to mount panel to pilaster. Inside of opening of 'U' Bracket shall be .50". All holes in Brackets for mounting panel to pilaster, panel to wall, and pilaster to wall, shall be pre-drilled. Holes are to be spaced at 9" O.C. along the full length of the Bracket for a total of seven (7) holes for mounting to wall, panel or pilaster. Each Bracket is to be packaged in a separate poly tube, and is to be labeled by stock number and manufacturer.

F. Hinge: 11 Gauge Stainless Steel Hinge. Hinge shall be made of Type 302/304 Stainless Steel and shall have a Satin finish. Hinge shall be gravity type for self-closing action and shall be fully adjustable up to 360 degrees. Pivot pin shall be made of Type 302/304 Stainless Steel. Hinges shall provide emergency access by lifting the door. Hinges shall be pre-drilled for mounting to door and pilaster with Stainless Steel Through-Bolts. Each Hinge is to be packaged in a separate carton, and is to be labeled by stock number, manufacturer, and left or right hand.

G. Strike and Keeper: Heavy Duty 14 Gauge Stainless Steel with a Satin finish. The Strike and Keeper shall be 2.50" high, with the mounting holes at 1.50" O.C. The Strike and Keeper shall have an integral rubber bumper door stop. Each Strike and Keeper shall be packaged in a separate poly bag, and is to be labeled by stock number and manufacturer. Furnish one per door.

H. Slide Latch: Heavy Duty 14 Gauge Stainless Steel with a Satin finish. The Slide Latch shall be surface mounted. The slide bar shall be .830" wide and 2.250" long. Latch shall have an internal Stainless Steel buffering spring to prevent damage when door is inadvertently slammed against the Latch. Mounting holes are to be spaced at 1.90" O.C. Latch knob is to be riveted to the slide bar and then welded to insure that the knob will not come off. Each Slide Latch shall be packaged in a separate poly bag, and is to be labeled by stock number and manufacturer. Furnish one per door.

I. Coat Hook: Heavy Duty Cast Stainless Steel with a Satin finish. Coat Hook and Bumper shall be 2.340" high, 1.230" wide and shall protrude out from the door 3.05". The hook portion shall have a finished diameter of .250". The stock number shall be molded into the back of the Coat Hook and Bumper for ease in identification. Each Coat Hook and Bumper shall be packaged in a separate poly bag, and is to be labeled by stock number and manufacturer. Furnish one per door.

J. Door Stop: Heavy Duty 14 Gauge Stainless Steel with a Satin finish. Plated Zamac Door Stops are unacceptable. Door Stop shall have a 2.05" x 1.48" base and shall protrude 1.75" from the wall. The bumper at the end of the Door Stop shall be .250" thick. The diameter of the shaft shall be .270". Each Door Stop shall be packaged in a separate poly bag, and is to be labeled by stock number and manufacturer. Furnish one for each Disabled Accessible door.

K. Pull Handle: Heavy Duty 14 Gauge Stainless Steel with a Satin finish. Plated Zamac Door Pulls are unacceptable. Pull Handle shall protrude from the face of the door 1.07" and shall be 4.21" long. The Pull Handle shall have mounting holes drilled at 3.54" O.C. The Pull Handle shall be .655" wide. Each Pull Handle shall be packaged in a separate poly bag, and is to be labeled by stock number and manufacturer. Furnish one for each Disabled Accessible door.

L. Overhead Bracing (Headrail): Continuous Heavy Duty Extruded 6063-T5 Aluminum Headrail with Anti-Grip profile. Headrail shall have integral reinforcing channel and curtain track. Headrail shall have a Satin Anodized finish. Provide Headrail Corner Brackets, Wall Brackets, and Headrail End Caps as required. The Headrail and Headrail Brackets shall have a minimum wall height of 2". The minimum wall thickness of the Headrail and Headrail Brackets shall be .125". Each Headrail Bracket is to be packaged in a separate poly bag, and is to be labeled by stock number and manufacturer.

M. Anchorages and Fasteners: All Fasteners shall be Stainless Steel with theft proof heads, Through-Bolted unless noted otherwise. Chrome plated steel or brass are not acceptable.

2.3 FABRICATION

A. General: Provide standard doors, panels, screens and pilasters fabricated for partition system, complete with all accessories and hardware listed above and as required for installation of fully functional system, unless otherwise noted. Provide units with cutouts and drilled holes to receive partition-mounted hardware, accessories, and grab bars as indicated.

B. Overhead-Braced and Floor-Anchored Partitions:
1. Furnish Heavy Duty Cast Stainless Steel "Z" Bars, complete with Stainless Steel threaded rods, lock washers and leveling-adjusting nuts at pilaster, to permit structural connection at floor.
2. Make provision for setting and securing continuous Extruded Aluminum Anti-Grip Headrail at top of each pilaster.
3. Furnish Stainless Steel Shoe at each pilaster to conceal supports and leveling mechanism.

C. Doors: Unless otherwise indicated, provide 24" (610 mm) wide in-swinging doors for standard Toilet Partitions and 36" (914 mm) wide out-swinging doors with a minimum 32" (813 mm) wide clear opening for Partitions indicated to be Handicapped Accessible.

D. Floor Anchored Privacy Screens: Furnish Privacy Screens consisting of a pilaster and a panel of the same construction and finish as the Toilet Partitions. Furnish in accordance with the drawings.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install Partitions rigid, straight, plumb, and level. Provide clearances of not more than .50" (13 mm) between pilasters and panels, and not more than 1.0" (25 mm) between panels and walls. No evidence of drilling, cutting and patching shall be visible in finished work.

B. Attach Continuous Wall Brackets to the wall with the following:
   1. At solid masonry: #14 x 1.50" long Stainless Steel Torx Head with Pin Screws and Plastic #14/16 Anchors at 9" O.C. vertical spacing.
   2. At cavity masonry: .25" diameter x required length Stainless Steel toggle bolts at 9" O.C. vertical spacing.

C. Overhead-Braced and Floor-Anchored Partitions: Secure pilasters to floor and level, plumb, and tighten. Secure continuous Headrail to each pilaster with not less than two (2) Through-Bolted Stainless Steel fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

D. Screens: Attach with anchoring devices according to manufacturer's written instructions and to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.2 ACCESSORIES

A. Mount accessories to Partition units in accordance with manufacturer's instructions.

3.3 ADJUSTING AND CLEANING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation.

B. Provide final protection and maintain conditions that ensure Toilet Partitions and Screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10 155

SECTION 10 265 - WALL AND CORNER GUARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Impact-resistant handrails.
   2. Corner guards.

B. Related Sections include the following:
   1. Division 8 Section "Door Hardware" for metal armor, kick, mop, and push plates.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance of Handrails: Provide handrails capable of withstanding the following structural loads without exceeding the allowable design working stress of materials for handrails, anchors, and connections:

   1. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
   2. Uniform load of 50 lbf/ft. (730 N/m) applied in any direction.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, impact strength, fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each impact-resistant wall-protection unit.

B. Shop Drawings: For each impact-resistant wall-protection unit showing locations and extent. Include sections, details, and attachments to other work.

   1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Initial Selection: For each type of impact-resistant wall-protection unit indicated.

   1. Include similar Samples of accent strips and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below. Include Samples of accent strips to verify color selected.

1. Corner Guards: 12 inches (300 mm) long. Include examples of joinery, corners, end caps, top caps, and field splices.
2. Handrails: 12 inches (300 mm) long. Include examples of joinery, corners, and field splices.

E. Qualification Data: For testing agency.

F. Material Test Reports: For each impact-resistant plastic material.

G. Material Certificates: For each impact-resistant plastic material, signed by manufacturer.

H. Maintenance Data: For each impact-resistant wall-protection unit to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

I. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.

C. Source Limitations: Obtain impact-resistant wall-protection units through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall-protection units and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Forest Certification: Provide products with wood rails produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."

F. Fire-Test-Response Characteristics: Provide impact-resistant, plastic wall-protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store impact-resistant wall-protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F (21 deg C) during the period plastic materials are stored.
2. Keep plastic sheet material out of direct sunlight.
3. Store plastic wall-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F (21 deg C).

    a. Store corner-guard covers in a vertical position.
    b. Store handrail covers in a horizontal position.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install impact-resistant wall-protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F (21 deg C) for not less than 72 hours before beginning installation and for the remainder of the construction period.

B. Field Measurements: Verify actual locations of walls, columns, and other construction contiguous with impact-resistant wall-protection units by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall-protection units that fail in materials or workmanship within specified warranty period.

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

    a. Structural failures.
    b. Deterioration of plastic and other materials beyond normal use.

2. Warranty Period: Five years from date of Substantial Completion.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of units installed, but no fewer than two, 4-foot- (1.2-m-) long units.

B. Include mounting and accessory components. Replacement materials shall be from same production run as installed units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Basis-of-Design Product: The design for each impact-resistant wall-protection unit is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 MATERIALS

A. Extruded Rigid Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout; thickness as indicated.

1. Impact Resistance: Minimum [**25.4 ft-lbf/in. (1356 J/m)**] of notch when tested according to ASTM D 256, Test Method A.
2. Chemical and Stain Resistance: Tested according to ASTM D 543.
3. Self-extinguishing when tested according to ASTM D 635.
4. Flame-Spread Index: 25 or less.
5. Smoke-Developed Index: 450 or less.

B. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated but with not less than strength and durability properties specified in ASTM B 221 (ASTM B 221M) for Alloy 6063-T5.

C. Stainless-Steel Sheet: ASTM A 240/A 240M.

D. Brass: ASTM B 249/B 249M for extruded shapes and ASTM B 36/B 36 M for sheet.

E. Solid Wood: Clear hardwood lumber of species indicated, free of appearance defects, and selected for compatible grain and color.

F. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

2.3 HANDRAILS

A. Solid-Wood Handrail HR-1: Assembly consisting of continuous sculpted, solid-wood handrail.

1. Basis-of-Design Product: C/S Group HRWS-6C.
2. Manufacturers:
   a. Construction Specialties, Inc.

3. Handrail: As indicated on Drawings with 1-1/2-inch- (38-mm-) diameter gripping surface.

   a. Returns, Corners, and Mounting Brackets: Stainless Steel.
   b. Wood Species: Maple.
   c. Finish: Clear.

2.4 CORNER GUARDS

A. Surface-Mounted, Resilient, Plastic Corner Guards CG-#: Assembly consisting of snap-on plastic cover installed over continuous retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.
   a. Basis-of-Design Product: C/S Group, SM-20.

2. Cover: Extruded rigid plastic, minimum 0.078-inch (2.0-mm) wall thickness; in dimensions and profiles indicated on Drawings.

   a. Profile: Nominal 3-inch- (75-mm-) long leg and 1/4-inch (6-mm) corner radius.
   b. Height: 4 feet (1.2 m).
   c. Color and Texture: As indicated on drawings.

3. Retainer: Minimum 0.060-inch- (1.5-mm-) thick, 1-piece, extruded aluminum.
4. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

2.5 FABRICATION

A. Fabricate impact-resistant wall-protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.

B. Preform curved semirigid, impact-resistant sheet wall covering in factory for radius and sheet thickness as follows:

1. Sheet Thickness of 0.040 Inch (1.0 mm): 24-inch (610-mm) radius.

C. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

D. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.6 METAL FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Remove tool and die marks and stretch lines or blend into finish.
2. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

B. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

C. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
2. For impact-resistant wall-protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing impact-resistant wall-protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. General: Install impact-resistant wall-protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
   a. Install impact-resistant wall-protection units in locations and at mounting heights indicated on Drawings

2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.

a. Provide anchoring devices to withstand imposed loads.
b. Where splices occur in horizontal runs of more than 20 feet (6.1 m), splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches (305 mm).
c. Adjust end and top caps as required to ensure tight seams.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 10 265

SECTION 10 305 - FIREPLACES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

A. Prefabricated Direct vent gas fireplaces.
B. Install at location as shown on the drawings.

B. Related Sections include the following:

1. Division 6 Section 06100- Rough Carpentry

1.3 PERFORMANCE REQUIREMENTS

A. Operational Performance: Provide pemanufactured gas burning fireplace with the following:
a. 26,000-36,000 BTU/hr Input
b. High Thermal Efficiency of 70% or more.
c. Airtight combustion chamber.
d. UL, A.G.A. design and CGA approval for natural gas and indoor use.

1.4 SUBMITTALS

A. Product Data: Manufactures product data.
B. Operation and Maintenance Data

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain fireplace as a complete unit from a single manufacturer, including fittings, accessories, bases, and anchorage devices.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver to site in original unopened packaging.

PART 2 - PRODUCTS

2.0 General: Heat-N-Glo model 80000TR is basis of design and performance.

A. Gas burning, top or rear venting, emergency shut-off valve, electronic ignition switch, remote control operable with imitation gas logs.

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Heat-N-Glo Fireplaces, Inc.
2. Superior, The Fireplace Company
3. Martin Fireplace

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install in strict compliance with manufacturer's written instructions and local codes.

END OF SECTION 10 305

SECTION 10 350 - FLAGPOLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Aluminum flagpoles.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for concrete footings for flagpoles, if any, and if not specified in this Section.
2. Division 7 Section "Sheet Metal Flashing and Trim" for flashing at roof-mounted flagpoles.
3. Division 7 Section "Joint Sealants" for elastomeric sealant filling the top of the foundation tube, if any.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide flagpoles capable of withstanding the effects of wind loads as determined according to the building code in effect for this Project or NAAMM FP 1001, "Guide Specifications for Design Loads of Metal Flagpoles," whichever is more stringent.

1. Flagpole with flag flying: Resistant to 90 miles per hour wind velocity without permanent deformation.
2. Flagpole without flag: Resistant to 147 miles per hour wind velocity without permanent deformation.
3. Flagpole height shall be 35 feet.

1.4 SUBMITTALS

A. Product Data: For each type of flagpole required. Include installation instructions.

B. Shop Drawings: Show general layout, jointing, grounding method, and anchoring and supporting systems.

1. Include details of foundation system for ground-set poles.

C. Structural Calculations: For flagpoles indicated to comply with certain design loadings, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Finish Samples for Verification: For each finished metal used for flagpoles and accessories.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each flagpole as a complete unit from a single manufacturer, including fittings, accessories, bases, and anchorage devices.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Spiral wrap flagpoles with heavy kraft paper or other weathertight wrapping and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Product specified as standard of quality is American Flagpole Company- Model No. 92106.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Baartol Co., Inc.
2. Concord Industries, Inc.
3. Eder Flag Manufacturing Co., Inc.
4. Ewing: John Ewing & Co. Inc.
5. Kearney-National Inc.; American Flagpole Div.
6. Lingo, Inc.; Acme Flagpole Co. Div.
7. Michigan Flagpole Inc.
8. Olympus Flag & Banner; EMC Div.
9. PLP Composite Technologies, Inc.
10. Pole-Tech Co., Inc.
11. Morgan-Francis Flagpoles

2.2 FLAGPOLES

A. Pole Construction, General: Construct poles and ship to Project site in one piece, if possible. If more than one piece is necessary, provide snug-fitting precision joints with self-aligning, internal splicing sleeve arrangement for weathertight, hairline field joints.

B. Aluminum Flagpoles: Fabricate from seamless, extruded tubing complying with ASTM B 241 (ASTM B 241M), alloy 6063, with a minimum wall thickness of .156 inch (4mm). Heat treat after fabrication to comply with ASTM B 597, temper T6.

1. Provide cone-tapered aluminum flagpoles.

C. Foundation Tube: Galvanized corrugated-steel foundation tube, 0.0635-inch (1.6-mm) minimum wall thickness, sized to suit flagpole and installation. Provide with 3/16-inch (4.8-mm) steel bottom plate and support plate; 3/4-inch- (19-mm-) diameter, steel ground spike; and steel centering wedges all welded together. Galvanize steel parts, including foundation tube, after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole.

D. Fiberglass Sleeve: Fiberglass foundation sleeve, made to fit flagpole and sized for installation, for casting into concrete foundation.

1. Provide flashing collar of same material and finish as flagpole.
2. Provide steel ground protectors extending 12 inches (300 mm) aboveground and 6 inches (150 mm) belowground for steel flagpoles where flashing collars are not provided.

E. Baseplate: Cast-metal shoe base for anchor-bolt mounting, of same metal and finish as flagpole. Provide with anchor bolts.

1. Provide ground spike at pavement-mounted metal flagpoles.

F. Hinged Baseplate: Cast-metal tilting baseplate or shoe base and anchored plate joined by permanently secured pivot pin. Provide with stainless-steel screws for securing tilting base to anchored plate when not tilted, and provide with anchor bolts.

1. Provide aluminum base or aluminum flashing collar; finish to match flagpole.
2. Provide ground spike at pavement-mounted flagpoles.

G. Pivoting Base: Steel baseplate with channel or rectangular tube uprights, pivot, and locking device. Provide flagpole with steel counterweight box and weights or with internal counterweight. Provide base with anchor bolts.

1. Finish base to match flagpole.
2. Provide ground spike at pavement-mounted flagpoles.

2.3 FITTINGS

A. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

B. Halyard Flag Snaps: Provide 2 swivel snap hooks per halyard, as follows:

1. Chromium-plated bronze.
2. Provide with neoprene or vinyl covers.

2.4 MISCELLANEOUS MATERIALS

A. Concrete: Comply with requirements of Division 3 Section "Cast-in-Place Concrete."

B. Concrete: Provide concrete composed of portland cement, coarse and fine aggregate, and water mixed in proportions to attain a 28-day compressive strength of not less than 3000 psi (20 MPa), complying with ASTM C 94.

C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

D. Sand: ASTM C 33, fine aggregate.

E. Elastomeric Sealant: Comply with requirements of Division 7 Section "Joint Sealants."

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Aluminum: Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

1. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Design Builderural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare in-ground flagpoles by painting below-grade portions with a heavy coat of bituminous paint.

B. Excavation: For foundation, excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete.

C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure forms, foundation tube, fiberglass sleeve, or anchor bolts in position, braced to prevent displacement during concreting.

D. Place concrete immediately after mixing. Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than 7 days or use a nonstaining curing compound.

E. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to base perimeter.

3.2 FLAGPOLE INSTALLATION

A. General: Install flagpoles where shown and according to Shop Drawings and manufacturer's written instructions.

B. Foundation-Tube Installation: Install flagpole in foundation tube, seated on bottom plate between steel centering wedges. Plumb flagpole and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch (50-mm) layer of elastomeric sealant and cover with flashing collar.

C. Baseplate Installation: Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space

under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

END OF SECTION 10 350

SECTION 10 400 - IDENTIFICATION DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: All interior and exterior signage and permanent plaques for location, directional, control, and information surface mounted signage as complete integrated modular system.

B. Related sections:
1.Section 09260: Gypsum Board Assemblies.
2. Section 09910: Paints.

C. Unit prices: Provide installed unit price for each type unit in designed system for extra possible required signage.

1.2 REFERENCES

A. Standards of the following as referenced:
1. American National Standards Institute (ANSI).

B. Industry standards:
1. Department of Justice, Office of the Attorney General, *Americans with Disabilities Act*, Public Law 101-336, (ADA).
2. ANSI A117.1: *Providing Accessibility and Useability for Physically Handicap People*, 1986 edition.
3. Federal Register Part III, Department of Justice, Office of the Attorney General, 28 CFR Part 36: *Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities, Final Rule*, July 26, 1991.
4. Federal Register Part II, Architectural and Transportation Barriers Compliance Board, 36 CFR Part 1191: *Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Amendment to Final Guidelines*, September 6, 1991.

1.3 DEFINITIONS

A. Terms:
1. Braille: Grade 2 Braille including 189 part-word or whole word contractions in addition to Grade 1 Braille 63 characters. Tactile is required whenever braille is required; see SYSTEM DESCRIPTION Article below.
2. Non-tactile: Letters and numbers on signs with width-to-height ratio between 3:5 and 1:1 and stroke width ratio between 1:5 and 1:10 using upper case "X" to calculate ratios. Use typestyles with medium weight; upper and lower case lettering is permitted; serif typestyles are permitted. See SYSTEM DESCRIPTION Article below.
3. Symbols: Symbol itself is not required to be tactile but equivalent verbal description is required both in tactile letters and braille.
4. Tactile: 1/32" raised capital letters without serifs at least 5/8" height and not more than 2" height based on upper case "X". Braille is required whenever tactile is required; see SYSTEM DESCRIPTION Article below.

1.4 SYSTEM DESCRIPTION

A. Signage under this section is intended to include items for identification, direction, control, and information of building where installed as complete integrated system from a single manufacturer.

B. ADA design requirements:
   1. Signage requiring tactile graphics:
      a) Wall mounted signs designating permanent rooms and spaces such as, room numbers and restroom, department, office, and fire exit identifications.
      b) Individually applied characters are prohibited.
   2. Signage not requiring tactile graphics but require compliance to other ADA requirements: All other signs providing direction to or information about function of space such as, directional signs (signs with arrow), informational signs (operating hours, policies, etc.), regulatory signs (no smoking, do not enter), and ceiling and projected wall mount signs.
   3. Excluded signage:
      a) Exterior signs.
      b) Building directories.
      c) Menus.
      d) Temporary signs, include personnel signs and tenant identification; suite numbers are not considered temporary.

C. ADA performance requirements:
   1. Tactile graphics signs mounting requirements:
      a) Single doors: Mount 60" to sign centerline above finish floor and on wall adjacent to latch side of door.
      b) Openings: Mount 60" to sign centerline above finish floor adjacent opening.
      c) No wall space adjacent latch side of door, opening, or double doors: Mount 60" to sign centerline above finish floor on nearest adjacent wall.

D. Building Dedication Plaque

E. Exterior Facility Name Sign

1.5 SUBMITTALS

A. Product data:
   1. Manufacturer's signed statement regarding compliance with QUALITY ASSURANCE Article.
   2. Manufacturer's product literature indicating units and designs selected.
   3. Evidence of manufacturer's computerized data retrieval program for tracking of Project for sign typography, message strip requirements and other pertinent data from schedule input to final computerized typography on finished product.

B. Shop drawings:
   1. Indicate materials, sizes, configurations, and applicable substrate mountings.
   2. Typography sample for message strips and headers copy.
   3. Signage schedule complete with location of each sign and required copy;

include floor plans, if required.

C. Samples: Full size samples for holder, insert, and copy in colors specified. Provide sample in small size sign. Samples will not be returned for use in Project.

D. Contract close out:
   1. Furnish appropriate checklist for aiding in reordering after Date of Substantial Completion.
   2. Maintenance data and cleaning requirements for exterior surfaces.

1.6 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a) Work required under this section from manufacturers regularly engaged in work of this magnitude and scope for minimum of five years.
      b) Maintain computer link between schedule input and computerized typography production.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Acceptance at site: Coordinate delivery of work to Project site under this section for immediate installation.

1.8 SEQUENCING AND SCHEDULING

A. Schedule system installation after related finishes have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Basis of Design:
   1. Architectural Signing, Inc. 3044 Adriatic Court, Norcross, Georgia 30071 Tel.: 770-448-2026
   2. Other manufacturer's products are acceptable if submitted in accord with Product Substitutions Procedures Section and are in strict compliance with these specified requirements:

B. Provide the following assemblies; locate where indicated in SCHEDULES Article: Combination of IMSystem components, consisting of holder unit mounted to substrate and insert panels secured to holder providing graphic and visual information.

C. Design units with selected components below.

D. Holder:
   1. Material: Integrally colored injection molded high impact UV resistant, colorfast, plastic alloy complete with mounting system; ready for insert installation.
   2. Corners: Square corners.

E. Edge detail: Square edge.

1. Mounting:
   a) Surface: Wall or vertical surface.
   b) Fastening: MFH.
2. Sizes: Indicated on drawings.
3. Color: Indicated on drawings.

G. Graphics:
1. Type sizes: Refer to drawings; meet ADA requirements for letter proportions and sizes where tactile units are used.
2. Type style or styles: Arial.
3. Furnish Grade 2 Braille characters for tactile signs; same text as letter designations and symbol translation indicated in DEFINITIONS Article.
4. Type code or codes: Uppercase.
5. Imprint colors: Refer to drawings; color contrast background colors in accord with ADA requirements.

H. Shop assembly:
1. Fabricate units to configurations indicated on reviewed shop drawings. Internally reinforce units in accord with reviewed shop drawings.
2. Provide copy on inserts, message strips, and covers required on reviewed shop drawings and in accord with ADA requirements.
3. Wrap each individual unit with polyethylene.

2.2 Building Dedication Plaque:

A. Acceptable Manufacturers:
1. Andco Industries Corp.
2. A. R. K. Mfg. Co., Inc.
3. Gemini, Inc.
4. Matthews International Corp.
5. OMC Industries, Inc.
6. The Southwell Co.

B. Characteristics:
1. Plaque: 2'-6" by 3'-9" bronze plaque with raised polished lettering.
2. Border style: Beveled edge, polished finish.
3. Background: Leatherette.
4. Letter style: Helvetica Medium.
5. Design: As indicated on drawings.

C. Mounting: Furnish manufacturer's standard concealed mounting hardware for attachment to finished surface.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of conditions:
   1. Examine areas to receive signage; notify Contractor in writing of unacceptable substrate.
   2. Beginning work indicates acceptance of substrate. Subsequent modifications to substrate or signage becomes this section's complete responsibility.

3.2 INSTALLATION

A. Install signage holders in locations with mounting types indicated in accord with reviewed shop drawings. Square, plumb, and level units.

B. Install inserts not more than 48 hours prior to Date of Substantial Completion complete with correct copy in place. Conform to ADA requirements for tactile graphics signage.

3.3 CLEANING

A. Clean exposed surfaces not more than 48 hours prior to Date of Substantial Completion in accord with manufacturer's written cleaning instructions.

END OF SECTION 10 400

SECTION 10 416 - DIRECTORIES AND BULLETIN BOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Nonilluminated directories.
2. Bulletin boards.

B. Related Sections include the following:

1. Division 16 Section "Wires and Cables" for electric service and connections to illuminated units.

C. Alternates: Refer to Division 1 Section "Alternates" for description of Work in this Section affected by alternates.

1.3 SUBMITTALS

A. Product Data: For each model indicated. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Shop Drawings: For each type of directory and bulletin board required.

1. Include dimensioned plans, elevations and details, large-scale sections of typical members, and other components. Show anchors, grounds, reinforcement and layout, and indicate finishes.
2. Include setting drawings, templates, and directions for installing anchor bolts and other anchorages to be installed as a unit of Work in other Sections.
3. Wiring diagrams from manufacturer for illuminated directories.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who is an authorized representative of the building directory manufacturer for installation and maintenance of units required for this Project.

1. The Installer shall be capable of providing replacement message strips within 10 working days of receipt of an order.

B. Source Limitations: Obtain building directories and bulletin boards through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of building directories and bulletin boards and are based on the specific model indicated. Other manufacturers' building directories with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

1. Do not modify intended aesthetic effects, as judged solely by Design Builder, except with Design Builder's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Design Builder for review.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify rough openings for directories by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating building directories without field measurements. Coordinate wall construction to ensure actual opening dimensions correspond to established dimensions.

1.6 EXTRA MATERIALS

A. Deliver extra blank message strips to Owner. Furnish extra message strips that match message strips installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Message-Strip Units: Furnish blank, full-size, message-strip units equal to 10 percent of amount installed for Owner's future use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Nonilluminated Directories:

a. Allen Marketing Products, Inc.; Allenite Design Builderural Sign Systems Division.
b. Andco Industries Corporation.
c. Apco Graphics.
d. ASI Sign System, Inc.
e. Best Manufacturing Company.
f. Charleston Industries, Inc.
g. Claridge Products and Equipment, Inc.
h. Greensteel, Inc.
i. Nelson-Harkins Industries.
j. Poblocki & Sons.

k. Ticket & Tablet Co. (The).
l. Vomar Products, Inc.

2. Bulletin Boards:

a. Andco Industries Corporation.
b. Claridge Products and Equipment, Inc.
c. Greensteel, Inc.
d. Nelson-Harkins Industries.
e. Poblocki & Sons.

2.2 MATERIALS

A. Aluminum Extrusions: Manufacturer's standard extruded-aluminum sections with not less than the strength and durability properties specified in ASTM B 221 (ASTM B 221M) for 6063-T5 alloy.

B. Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), 6 mm thick.

2.3 NONILLUMINATED DIRECTORIES

A. Nonilluminated Directories: Provide a fully recessed, nonilluminated directory consisting of a cabinet with an operable transparent cover, and a retainer frame containing a header panel and a letter board or removable message strips. Graphics for message strips, header panels, and other designs shall be in the letter style, size, spacing, and arrangement indicated.

1. Cabinet Housing: Provide perimeter cabinet frame fabricated from aluminum extrusions of the profile indicated, mitered and welded with an aluminum-sheet rear cover panel. Provide structural reinforcement to prevent racking and misalignment.

a. Provide mullions between individual units as indicated.

2. Frameless Cover Design: 6-mm-thick, bronze, acrylic cover with acrylic returns to engage the perimeter frame.

3. Changeable-Letter-Type Message Strips: Black-felt, vinyl- or rubber-covered strips, of size indicated, grooved to receive changeable letters.

2.5 BULLETIN BOARDS

A. Bulletin Boards: Provide surface-mounted, horizontal sliding non-illuminated bulletin boards consisting of a cabinet housing with an operable transparent cover, containing with tackable surface of material indicated. Provide graphics for header panels and other designs in the letter style, size, spacing, and arrangement indicated.

1. Perimeter Frame and Cover Design: Match perimeter frame and cover design of directories.
2. Perimeter Frame and Cover Design: Extruded-aluminum perimeter cabinet frame of profile indicated. Provide sliding glass doors glazed with tempered glasse.

a. Operating Hardware: Provide extruded-aluminum top and bottom track, extruded-aluminum bottom shoes, nylon rollers, rubber top guides, rubber bumpers, grooved finger pulls, and adjustable lock.

2.6 ACCESSORIES

A. Fasteners: Provide screws, bolts, and other exposed fastening devices of the same material as the items being fastened. Fasteners for applications on the exterior and exposed to the weather shall be hot-dip galvanized, stainless steel, or aluminum. Provide types, gages, and lengths to suit installation conditions. Use theft-proof fasteners where exposed to view.

B. Hardware: Provide building directories and bulletin boards with the following hardware:

1. Hinges: Concealed pivot hinges.
2. Hinges: Continuous-type piano hinges.
3. Locks: Furnish each cover with manufacturer's standard lock; key locks alike. Furnish 2 keys per lock.

2.7 FABRICATION

A. General: Fabricate directories and bulletin boards to requirements indicated, including dimensions, design, and thickness and finish of materials. Use metals and shapes of thickness, with reinforcing if needed, to produce flatness, free of oil canning, and to impart strength for size, design, and application indicated.

1. Fabricate perimeter cabinet and cover frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.
2. Hardware for Covers: Equip covers with hardware of type indicated.
3. Weatherproofing: For units located on the exterior, provide weatherproof construction, including weather-stripping and venting provisions for condensation control.

2.8 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Design Builderural and Metal Products" for recommendations relative to applying and designating finishes.

B. Colors: Where message strips, header panels, or other items, other than frames or glazing materials, require color selection to distinguish letters or graphic images from the background or for other purposes, provide colors as selected by Design Builder from manufacturer's full range of colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine wall surfaces, with the Installer present, for compliance with requirements and other conditions affecting installation of building directories and bulletin boards.

1. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units plumb and level, in locations and with mountings shown. Securely attach to supporting structure with concealed fasteners, according to manufacturer's written installation instructions.

3.3 CLEANING AND PROTECTING

A. At completion of installation, clean surfaces according to manufacturer's written instructions.

B. Protect installed directories and bulletin boards from damage until acceptance by Owner at the time of Substantial Completion.

END OF SECTION 10 416

SECTION 10 522 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 - GENERAL

1.01REFERENCES

A. Standards of the following as referenced:
   1. ASTM.
   2. National Fire Protection Agency (NFPA).
   3. Underwriters' Laboratories, Inc. (UL).

B. Industry standards:
   1. Department of Justice, Office of the Attorney General, *Americans with Disabilities Act*, Public Law 101-336, (ADA).
   2. Federal Register Part III, Department of Justice, Office of the Attorney General, 28 CFR Part 36: *Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities*; Final Rule, July 26, 1991.
   3. Federal Register Part II, Architectural and Transportation Barriers Compliance Board, 36 CFR Part 1191: *Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Amendment to Final Guidelines*, September 6, 1991.
   4. NFPA 10: *Portable Fire Extinguishers*, 1990 edition.

1.2 SUBMITTALS

A. Shop drawings: Include roughing-in dimensions, mounting details, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, style and materials.

1.3 QUALITY ASSURANCE

A. Regulatory requirements:
   1. Furnish extinguisher units bearing UL "Listing Mark" for type, rating, and classifications of extinguishers indicated.
   2. Comply with NFPA 10-1990 requirements for placement and heights.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Acceptable manufacturers:
   1. Elkhart Brass Manufacturing Company.
   2. J.L. Industries, Inc.
   3. Larsen Manufacturing Company.
   4. Norris Industries.
   5. Standard Fire Equipment Div./Zurn Industries, Inc.

B. Extinguishers:
   1. Multi-purpose dry chemical extinguisher:
      a. Capacity: Ten lbs.

b. UL Rating: 4A-60B:C.

2. Extinguishers complete with nozzle and pressure gauge.

3. Manufacturer's standard bracket supporting extinguisher at top and bottom; holding extinguisher off finished wall surface.

C. Fire extinguisher cabinets:
1. Type: Semi-recessed.
2. Size: Required for extinguishers.
3. Cabinet material and finish: Minimum 18 gauge steel, prefinished in white enamel.
4. Door and trim material: Minimum 18 gauge steel, prime painted.
5. Door:
a. Type: Duo vertical panel.
b. Glazing: Tempered glass.
c. Lettering: FIRE EXTINGUISHER in red pressure sensitive vinyl (PSV); lettering running horizontal. Furnish PSV lettering loose for installation after painting.
6. Hardware: Equip door with full length piano hinge, roller catch, and pull.
7. Furnish WH certified design cabinet for use in one and two hour combustible and non- combustible wall construction meeting requirements of ASTM E814-88.

D. Bracket mounted unit decals: Red letter decals spelling "FIRE EXTINGUISHER" for application to vertical surface above unit; letter size, style, and location in accord with NFPA requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fire extinguisher cabinets:
1. Secure in walls, plumb and level; attach to structure in accord with manufacturer's installation instructions.
2. Set at height complying with NFPA 10-1990 and ADA requirements for extinguisher top height from finish floor; in no case more than 5'-6" to cabinet top.
3. Caulk perimeter with sealant in accord with Joint Sealants Section.
4. Install pressure sensitive vinyl lettering on each cabinet door after field painting.

B. Brackets: Install at height complying with NFPA 10-1990 requirements for extinguisher top height from finish floor at indicated or NFPA 10-1990 required locations; in no case more than 5'-0" to extinguisher top.

C. Extinguishers: Install charged extinguishers not more than 48 hours prior to Date of Substantial Completion.

D. Identification for bracket mounted extinguishers: Install decals above each extinguisher unit in accord with NFPA 10-1990 and ADA.

END OF SECTION 10 522

SECTION 10 525 - EMERGENCY AID DEVICES - AEDs

PART 1. GENERAL

1.1 WORK INCLUDED

A. Automatic External Defibrillators
B. Accessories
C. Cabinet

1.2 RELATED WORK

A. Section 06 100 Rough Carpentry
B. Division 16 Electrical

1.3 QUALITY ASSURANCE

A. Conform to American with Disabilities Act 1990 on maximum cabinet projection of 4" in corridors where necessary.
B. Building owner to provide physician's prescription as required for placement of AED units in a building.
C. Building owner to set up proper training of AED unit provided by the American Heart Association.

1.4 SUBMITTALS

A. Submit brochure and product data in compliance with Section 01 340

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver to site in original unopened packaging
B. Store at job site in a manner that will avoid damage, damaged equipment will be rejected

PART 2. PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

A. Where shown on the drawings, provide Cabinet, AED, and accessories manufactured by:

Cardiac Science
1900 Main Street
Suite 700
Irvine, CA 92614
949.851.4418 CSI Order Entry Fax

Mike Czabala, Territory Sales Manager
678.575.1663 Phone
770.557.0424 Fax

2.2 AED UNIT

A. Powerheart AED G3 AUTOMATIC package with text display: biphasic waveform and internal memory, 9146 battery, SKU 9300A-201
B. Carrying case for 9300 series AED G3, SKU 168-6000-001
C. Semi-recessed AED wall mount storage case with strobe light alarm, security system enabled, SKU 180-2021-003
D. Defibrillation pads (adult), SKU 9131-001

PART 3. EXECUTION

3.1 INSTALLATION

A. Install Cabinet, AED device and accessories where shown and according to Shop Drawings and manufacturer's written instructions, and in compliance with applicable regulations of governing authorities.
B. Prepare recess in wall for AED cabinet as required by type and size of cabinet and style of trim to comply with manufacturer's instructions.
C. Securely fasten cabinet to structure, square and plumb, to comply with manufacturer's instructions
D. Connect electrical wiring from security panel to AED cabinet contacts.

END OF SECTION 10 525

SECTION 10 810 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Related sections:
1. Section 09260: Gypsum Board Assemblies.
2. Section 10155: Toilet Compartments.

1.2 REFERENCES

A. Standards of the following as referenced:
1. American Iron and Steel Institute (AISI).
2. American National Standards Institute (ANSI).

B. Industry standards:
1. Department of Justice, Office of the Attorney General, *Americans with Disabilities Act*, Public Law 101-336, (ADA).
2. ANSI A117.1: *Providing Accessibility and Usability for Physically Handicap People*, latest edition.
3. Federal Register Part III, Department of Justice, Office of the Attorney General, 28 CFR Part 36: *Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities*; Final Rule,latest edition
4. Federal Register Part II, Architectural and Transportation Barriers Compliance Board, 36 CFR Part 1191: *Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Amendment to Final Guidelines*,latest edition.

1.3 SYSTEM DESCRIPTION

A. Design requirements: Meet ANSI A117.1 grab bar loading requirements.

1.4 SUBMITTALS

A. Product data:
1. Complete list of products for use.
2. Include catalog cuts and data sheets indicating size, material and finish, complete parts list, and installation procedures for each accessory.
3. *"Manufacturer's Safety Data Sheets"*, (M.S.D.S.), for materials.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage and protection: Maintain manufacturer's protective covering on accessories until final clean-up.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate construction activities in this section with section or sections where accessories are installed.

B. Furnish anchor plates and built-in accessories templates at appropriate time for incorporation into construction activities performed in other sections.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Toilet accessories:
1. Acceptable manufacturers:
2. Products specified as standard of quality are manufactured by Bobrick Washroom Equipment, Inc., referred to as “Bobrick”.
3. Products of manufacturers listed below meeting indicated standards and specified manufacturer's product data characteristics, except as modified below, are acceptable for use, subject to prior approval of proposed product list.
   a) American Specialties, Inc.
   b) Bradley Washfountain Company.
   c) McKinney/Parker Washroom Accessories Corp.
4. Furnish accessories as product of one manufacturer, except where certain special items are indicated. Key keyed accessories alike with exception of coin receiving boxes on vending equipment. Key vending equipment in accord with Owner's requirements.
5. Materials: Use AISI Type 304 stainless steel, (non-austenitic), for all parts except mounting kits for grab bars or specific items noted otherwise.
6. Fasteners: Toilet and bath accessory manufacturer's recommended fasteners for substrate encountered.
7. Toilet and bath accessories: Scheduled in SCHEDULES Article.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of conditions:
1. Verify built-in accessory plates and related items are in correct location and position.
2. Check openings scheduled to receive recessed or semi-recessed accessories for correct dimensions, depth, plumbness of blocking for frames, and preparation affecting accessories installation.

3.2 INSTALLATION

A. General:
1. Built-in accessory plates: Furnish for installation under construction activities specified in other sections.
2. Install accessories level, plumb, in indicated locations.
3. Installation methods indicated in manufacturer's literature for substrates

encountered.

B. Mounting heights, general:
   1. Mount toilet and bath accessories where indicated.
   2. If mounting heights are not indicated, mount at toilet and bath accessory manufacturer recommended height.
   3. Accessory items indicated by code *"for use by the handicapped"*: Mount at height required by ANSI A117.1 and ADA; use more restrictive requirement unless otherwise indicated in case of conflict.

C. Wall conditions, grab bars:
   1. Stud walls: Attach to stud wall system using accessory manufacturer supplied continuous length steel anchor plate and mounting kits at indicated locations on grab bar wall side.
   2. Toilet compartment: Attach to toilet compartments using accessory manufacturer supplied stainless steel anchor assembly and mounting kits.

   3. Conceal evidence of drilling, cutting, and fitting adjacent finishes.

3.3 ADJUST AND CLEAN

A. Adjust accessories operating parts for correct operation.

B. Clean and polish exposed surfaces not more than 48 hours prior to Date of Substantial Completion.

C. Deliver accessory schedule, keys, and parts manual as part of Project Close-out documents.

3.4 SCHEDULES

A. Towel dispenser/waste combination: Bobrick Contura #39603; recessed.
B. Toilet tissue dispensers:
   1. Recessed multi-roll; Bobrick Contura #B-4388
   2. Partition mounted multi-roll for two compartments; Bobrick Contura #B-4386
C. Stand alone waste receptacle: Bobrick Contura #B-2250, 13 gal with swing top.
D. Grab bars:
   1. Horizontal or vertical: Bobrick #B-6206 by lengths indicated.
      a) Mounting kits: Bobrick #252 Series for wall condition.
      b) Stud walls: Bobrick #256 Series concealed continuous anchor plates.
      c) Toilet compartments:
         1) One side installation: Bobrick #258 Series anchor plates; one per flange.
         2) Back-to back installation: Bobrick #259 Series anchor plates; one per flange.
E. Sanitary napkin vendors: Bobrick Contura #B-43500; recessed.
F. Sanitary napkin disposal units: Bobrick Contura #B-270; recessed, B#4354; compartment mounted.
G. Soap dispensers: GoJo Industries:Ceramic White Dermapro#9034-1, 800ML; surface mounted and Technical Concepts: Chrome ":One Shot" Touch-Free Automatic Soap System #401310 for counter top mounting.
H. Seat cover dispensers: Bobrick Contura #4221; surface mounted.

I. Mop and broom holders: Bobrick B-#223 by 36".
J. Mirrors: Bobrick #B-2908 12048 in toilets 109, 110, &106.

END OF SECTION 10 810

SECTION 11 400 - FOOD SERVICE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All work included under this section is subject to Architect's provisions covering: Invitation to Bid, Proposal Form, Instructions to Bidders, General Conditions, and all other Supplementary General Conditions as may be added.

1.2 SCOPE OF WORK

A. All specified equipment to be delivered to job site, freight prepaid, uncrated, assembled and set in proper area, ready for final connections, where required, as specified in Divisions 15 and 16 of Contract Documents.

B. Related Sections include the following:
   1. Division 15
      a. Provide all gas, water lines and other necessary work including final connections to equipment.
      b. Provide all hoods or canopies and ducts to exhaust fan including ducts to those hood(s) specified in this Section of Contract Documents.
      c. Provide all faucets, special switches, valves, traps, labor and materials to make final connections to equipment unless specifically specified in this Section.
   2. Division 16
      a. Provide all electrical utility lines and other work including final connections to equipment.

1.3 DESCRIPTION

A. The extent of the Food Service Equipment is shown on the Drawings, Equipment Schedule, and Specifications of this Section of Contract Documents. Each model number includes the code *C013 as a suffix. This code is known as the Specifier Identification System. It is not to be removed by the bidders. Its purpose is to identify the specifier to the vendors providing the equipment in the event it is necessary to communicate questions, clarifications and comments, from prior to bid award through the final purchase. It is to be used on all correspondence including fax and e-mail when communicating with manufacturer representatives and factories.

B. The plans indicate the location of the equipment. Slight changes due to the varying dimensions of equipment and wall construction shall be permitted with approval by the Architect.

C. These typed Specifications shall be closely correlated with the Drawings and Schedule. Each complements the other and cross-reference shall be necessary to fulfill the requirements of these Specifications. All information shown on Drawings and listed in Schedules are to be incorporated as part of the written Specifications.

D. Conflict in Plans and Specifications where changes, alterations, additions, or deductions are necessary, or where exceptions are taken with regard to sizes, locations, and other details shown on plans, shall be reported in writing for a decision by the Architect.

E. The Contractor shall be responsible for seeing that the equipment can be entered through openings before doors and walls are finished.

1.4 QUALITY ASSURANCE

A. Permits and Certificates: All laws, codes, ordinances and regulations bearing on the conduct of the work as drawn and specified shall be complied with and give all notices required. Any work upon which an inspection certificate by local authorities, or any governing body is required, such Inspection Certificate or Certificates shall be obtained and paid.

B. Certificates of acceptance or of completion as required and issued by the State, Municipal, or other authorities shall be procured and delivered to the Owners. The Owners may withhold payments which are due or which may become due until the necessary Certificates are procured and delivered to Owners.

C. All safety devices and all accessories required to comply with regulations and governing codes shall be provided, regardless of whether or not specified or called for in the following technical divisions of the equipment list portion of this Section of Specifications.

D. Applicable Manufacturing Standards: Special fabrication items shall be manufactured in compliance with Standard No. 2 of the National Sanitation Foundation Testing Laboratory, and shall bear the NSF Seal of Approval.

E. Equipment pieces shall be manufactured in compliance with Standards No. 3, 4, 5, 6, 7, 8, 12, 18, 20, 29, 35, 37, 51 and 61, where applicable, of NSF Testing Laboratories and bear the Seal of Approval. This shall include any pending standards, which shall become applicable at the time equipment is delivered.

F. Electrical Equipment shall conform to the standards of the National Electrical Manufacturers Association (NEMA). Equipment shall have conveniently located control switches, enclosed case type, comply with State of Georgia Electric Code, and bear the label from an approved Testing Laboratory. (UL or ETL)

G. Electrically heated and motor driven fixtures shall be for the current shown in the Mechanical and Electrical plans. These items of equipment shall have mounted motor starters, switches and controls. All shall be required for each fixture or complete section of a fixture, or as specified.

H. Gas burning equipment to be designed for operation with the type of gas furnished, and approved by the American Gas Association. The label or listing of the American Gas Association shall be accepted as conforming to this requirement. Installation of equipment shall conform to the standards as set forth by the American Gas Association, and the National Plumbing Code. Where required, all gas equipment shall be furnished with safety pilot and one hundred percent safety cut-off.

I. NFPA Codes 13, 17 and 96 standards shall be complied with for exhaust system.

J. Miscellaneous Requirements
   1. Plumbing:

a. Provide chrome plated faucets specified certified to NSF standard 61, Section 9. All backsplash-mounted faucets shall be provided with double male nipples having locknuts for rigidly securing the faucet to the backsplash. Nipple-locknut assembly shall be provided under this section, as part of the faucet.
b. Provide all wastes incorporated in the custom-built fabricated Food Service Equipment. Provide all wastes with chrome-plated tailpiece.

2. Electrical:
   a. Interwiring of Food Service Equipment between heating elements, switches, starters, thermostats, outlets, motors and solenoid shall be complete to junction box, terminal box or disconnect switch, (should Specifications call for disconnect switch to be provided in this Section).
   b. Provide grounded receptacles specified under the Item No. of detail Specifications or as shown on the Contract Drawings. All receptacles to be as specified and furnished with stainless steel face plate.
   c. All electrically operated equipment to be in accordance with the codes, regulations and the laws of the State of Georgia.
3. Safety:
   a. All Food Service Equipment provided under this Contract shall be manufactured and installed in conformance with the Williams-Steiger Occupational Safety Health Act of 1970.
4. Coordination:
   a. Coordinate with Project's plumbers and electricians to assist in cutting or knocking out holes in the stainless steel tables, counters and cabinet bases to allow for efficient utility connections to equipment.

K. Contractor shall be held responsible and liable for any and all changes or variances from Contract Documents, without written authorization from Architect for said changes or variances.

1.5 REFERENCES

A. The Drawings indicate the desired basic arrangement and dimensions of the equipment. Minor deviations may be substituted for approval provided basic requirements are met and no major rearrangement of service to the equipment is required to affect the proposed alteration. These deviations shall be made without expense to the Owner.

B. Operational and functional tests of the installed equipment are required. Defects or deficiencies shall be corrected to the satisfaction of the Architect or Owners at the expense of the Contractor. Consult the Mechanical and Electrical Connections Drawings and they're accompanying Specifications to determine additional requirements of the work, and shall cooperate with all trades to insure a satisfactory installation.

C. The electrical wiring of motors, motor starters, switches and thermostats of the equipment shall be an integral part of the unit which shall contain a junction box for connection of electrical service. All motor driven equipment shall have thermal overload and underload protection.

D. Furnish on each motor driven appliance, or electrically heated unit, a suitable mounted control switch or starter of proper type in accordance with UL or ETL Codes. All controls mounted on vertical surfaces of fixtures shall be set into recessed die-stamped stainless steel cups or otherwise indented to prevent damage to control switch.

1.6 SUBMITTALS

A. General: Refer to General Requirements Section 01300 - Submittals

B. Shop Drawings: Verify all field measurements on the job site to insure proper fitting of all equipment. Within thirty days after award of contract, submit to the Architect for tentative approval dimensional Rough-In Drawings, drawn on a scale of 1/4" = 1'-0", showing and giving detailed information of mechanical and electrical utility service lines, each on separate sheets. At the same time, submit complete brochures, cuts, and technical data of manufactured items he is furnishing for the Architect's tentative approval. Within forty-five days after the award of contract, submit to the Architect custom-built fabricated equipment shop drawings for their tentative approval, drawn to a scale of not less than 3/4" = 1'-0" for all special fabricated items such as work tables, sinks, dish tables, etc.

C. Partial submittals shall not be accepted.

1.7 HANDLING AND STORAGE

A. Protect metal and millwork product finishes from damage during shipping, storage, handling, installation and construction of other work in the same spaces. Wrap and crate each item of equipment as needed for protection from damage.

B. Cover exposed stainless steel surfaces and millwork surfaces with self-adhesive protective paper, of a type recommended by the metal and millwork manufacturer; and do not remove until work is installed and ready for cleaning and start-up.

1.8 SCHEDULING:

A. Schedules and Reports: Establish earliest and latest job site delivery dates of furnished and Contractor installed items.

B. Delivery of Owner furnished equipment for installation shall take place at a time to be determined by Owners, but not necessarily during normal working hours.

1.9 SUBSTITUTION

A. Substitution of Materials and Equipment: Whenever a material, article, or piece of equipment is identified on the Drawings or in the Specifications by reference to manufacturers' or vendors' names, trade name, catalog numbers, or the like, it is so identified for the purpose of establishing a standard. Any material, article, or piece of equipment of other manufacturers or vendors which shall perform adequately the duties imposed by the general design, shall be considered equally acceptable provided, in the opinion of the Architect, it is of comparable substance, construction, appearance and function. It shall not be purchased or installed without Architect's written approval. Substitute items shall be submitted to Architect at least ten days before bid date for review and consideration. Items that are acceptable shall be so stated in an Addendum.

1.10 WARRANTY

A. Workmanship and Guarantees: Equipment shall be delivered in an undamaged condition upon completion. All workmanship and labor shall be of the best in their respective fields and skilled mechanics of the trades involved.

B. All equipment as specified in this Section shall be guaranteed for a period of one year from the time of substantial completion. If, at any time within this warranty period of one year, any equipment that is found to be faulty due to poor workmanship, inferior or defective materials, replace said pieces or correct each defective part at no cost to Owners.
   1. Refrigerated items shall have an additional four-year warranty on the compressor unit. On extended compressor warranty, only labor charges after first year shall be paid.

C. At the end of first year, assign extended warranties to Owners on equipment having more than one-year warranty from Manufacturer.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Stainless steel shall be austenitic steel alloy, 8% nickel, 18% Chromium; not more than 0.2% carbon; not more than 2.0% of any other alloying elements; and must meet the requirements of the American Iron and Steel Institute Designations for Type 302 and Type 304 Stainless steel. Type 430 Stainless steel (straight chrome - no nickel) shall not be acceptable for custom-built fabricated equipment.

B. All sheets shall have genuine mill finish of not less than commercial #4 on exposed side and with not less than #2 on unexposed side. All stainless steel shall be stretcher leveled, with thickness of:
14 Gauge - Not less than 0.075 Inch
16 Gauge - Not less than 0.063 Inch
18 Gauge - Not less than 0.050 Inch
20 Gauge - Not less than 0.038 Inch

C. Galvanized Steel shall be copper-bearing steel. Galvanized angles or channels shall be of copper-bearing steel as specified for sheets. All fabricated edges of sheets or angles shall be protected by a special metalization process to give all fabricated edges and surfaces equal protection to the finished surfaces.

D. Finish for all galvanized steel shall be Hammer Tone Gray paint or two coats of aluminum lacquer, except G.I. undershelf and drawers.

E. Welding shall be of electric arc or oxy-acetylene gas. Welding shall be done with rod of same material and full penetration in the entire length of the joint. Welds to be flat without buckles, voids or imperfections. All welds shall be ground flush with adjacent surfaces, conditioned to eliminate dangerous surfaces. All shear cuts or bends that tend to open the surface of the metal shall be rewelded, ground and polished. All edges are to be ground and filed to eliminate sharp or rough edges.

F. When stainless steel sheets have grain running in different directions, the sheets shall be so jointed and welds run and finished in such a manner as to make the sheets appear as one continuous product.

G. Gauges: All Gauges of metals, where specified, shall be manufactured to the standards set forth by the U.S. Standard for Sheet Metal.

1. Unless specified, no material shall be finished lighter than 20-gauge for custom-built fabricated equipment.

H. Sound-Deadening: The undersides of dish tables shall be sound-deadened to no less than 1/8" thick and allowed to dry thoroughly before being finished with two coats of paint.

2.2 FABRICATION

A. Metal Tops for Tables:
1. Shall be constructed of 14-gauge stainless steel with butt joints welded, ground and polished smooth, resulting in a one piece top without joints and crevices. Tops are to be reinforced by means of 12-gauge channel irons, 1" x 5" x 1" x 1/8", securely fastened to underside, on 30" centers, by studs or welding in a vermin-proof manner. Free standing ends are to be turned down 1-3/4" on bull-nose edge or 2" rolled down edge with all exposed corners rounded on a 2-1/2" radius, or bull-nose corner. Where table borders on or is adjacent to wall, there is to be a 4” high backsplash with 1” turn back to wall with welded enclosed ends, unless otherwise specified. See Drawings for typical details.
2. Sleeves: Where legs, standards, pipes, or pipe chases come through a work area or table top, they shall pass through 3" high stainless steel sleeves, with the periphery fully welded and polished to match adjacent surfaces.

B. Cabinet Bases:
1. Tops shall be as otherwise specified for metal tops. Frames of bases shall be 1-1/2" x 1-1/2" x 1/8" angles rigidly reinforced at corners. Tops to be secured to body by concealed studs welded to underside of top. Studs to pass through holes of body frame and be securely fastened with stainless steel lock washers and nuts. Frames shall be covered back and ends with continuous sheets of 20-gauge stainless steel, folded into front opening. Cabinet shall have two shelves, one lower and one intermediate. All shelves shall be constructed of 18-gauge stainless steel and shall be fixed type. Bases shall be supported on 8" high legs NSF approved stainless steel legs with adjustable stainless steel bullet feet.

C. Sinks:
1. Shall be constructed of 14-gauge stainless steel sheets with all interior corners rounded on at least a 1/2" radius. All bottom corners shall be fully coved. All joints to be welded, ground, polished and made to match adjacent surfaces. Provide each sink with a 2" chromium plated waste outlet with a stainless steel strainer and Chromium Plated tailpiece. Provide with a rotary lever handle waste valve. Wastes are to be depressed in sink bottoms with bottoms inclining down towards the wastes. Wastes shall be Model 10707 manufactured by Fisher Mfg. Co. or approved Model by Component Hardware Group, Inc and Zurn. Rotary handle shall have front stainless steel bracket support welded to underside of sink compartment. Backsplash against wall shall be 8" high with 2" turned back on 45 degree angle with enclosed welded ends. Support sinks on legs and gussets, as specified, with braces from front to rear only. See Drawings for backsplash typical details.
2. All backsplashes against wall shall be sealed with clear Polysulphide Sealant.
3. Each compartment shall have cut-out on rear to accommodate overflow assembly provided with drain assembly. Overflow and drain assemblies shall be installed and made watertight.

D. Insert Sinks:
1. Shall be sized and shaped as specified with same construction as required for other sinks except that no backsplash is required. The sinks are to be welded into tabletops. All welds are to be ground and polished smooth. Provide with wastes as specified for sinks. Legs and gussets shall be furnished where sinks are set at end of tables.

E. Drain Tables and Drain Boards:
1. Shall be constructed of 14-gauge stainless steel, size and shape as specified. They are to be made integral with sinks. The front and free ends are to be constructed with a minimum of 3" high 1-1/4" to 1-1/2" rolled rim on an 180 degree turn, unless otherwise specified. Backsplash shall be same height as for sinks, same construction, and integrally welded with sink. Construct Drain tables or boards to allow liquids to drain into sinks.

F. Undershelf:
1. Undershelves are to be constructed in sections of 18-gauge stainless steel and notched out to fit around legs, and be fixed type. Intermediate shelves are to be constructed of 18-gauge stainless steel and be fixed type construction, unless otherwise specified.

G. Overshelves:
1. Overshelves shall be fabricated of 16-gauge stainless steel with edges rolled down or up and supported as specified.
2. Overshelves mounted on table tops shall be supported by 16-gauge stainless steel tubular legs. Legs are to be securely fastened to table top with fasteners similar to Model No. 1557-1010-3301, manufactured by Standard-Keil Hardware Manufacturing Company or approved manufacturer.

H. Wall Shelves:
1. Wall Shelves shall be fabricated of 16-gauge stainless steel and same construction as "Overshelves". Secure brackets to wall with stainless steel screws with expansion shields. Brackets shall be spaced on a maximum of 4'-0" O.C.
2. Wall shelves may also be supported on table's extended rear legs with cantilevered supports of 14-gauge stainless steel flag brackets.

I. Sliding Doors:
1. All sliding doors shall be double pan construction, 18-gauge stainless steel face, 20-gauge stainless steel rear, unless otherwise specified. Doors shall be a maximum of 5/8" thick, filled with sound-deadening material. Provide drawer front with an integral horizontal pull, the full length of the drawer front. Refer to typical drawer detail.
2. Sliding doors shall be provided with limit stop fitted with neoprene grommet. Mount doors on 2" diameter ball bearing rollers and supported in aluminum overhead channel tracks or NSF approved lower tracks.
3. All corners shall be welded, ground and filed smooth.

J. Drawers:
1. Lift out type drawer body, one piece 20-inches x 20-inches x 5-inches deep, unless otherwise specified. Drawer pan stamped of 20-gauge stainless steel with inside radiused corners. Construct drawer face of double wall stainless steel, 16-gauge exterior and 20-gauge interior with integral horizontal pull. Fill void in drawer front with sound deadening material. Mount drawer pan in 18-gauge stainless steel cradle with roller bearing slides with stops. When fully extended, drawer to support a minimum 200 pounds. Enclose drawer in 18-gauge stainless steel housing on sides and rear. Design

pan carrier to be full opening without tilting. Provide with manual operated release latches to allow drawer removal. Drawer assemblies shall be positive self-closing type.

K. Legs, Braces, Gussets, Feet and Handles:
1. Height of tables and other fabricated items of equipment shall be as specified. Legs shall be of 1-5/8" O.D. stainless steel 16-gauge tube spaced at intervals of 5"-6" centers.
2. Legs are to be braced by 1-5/8" O.D. stainless steel 16-gauge tube, welded to legs, or securely fasten the undershelf to legs, 10" above the floor. Weld all around periphery at joint to legs and grind smooth. The braces shall be constructed to form rectangular, or "H" frames, and there shall be at least one brace welded to each leg.
3. Gussets shall be stainless steel NSF approved, cylindrical type with setscrew. Leg gussets are to be welded to underside of tables, to reinforcing channels, and underside of sinks. Gussets shall be Model A20-0206 manufactured by Component Hardware Group Inc. or comparable stainless steel gussets manufactured by Standard-Keil Hardware Manufacturing Company, United Showcase and Component Hardware.
4. Feet shall be stainless steel adjustable bullet shape, fully enclosed, tightly fitting the leg. Provide 1” up and down adjustment from the central position, at no time exposing any threads. Adjustments are to be easily made by hand without the use of tools. For counters and cabinet bases, the feet shall be the same as for above. Feet having comparable quality to Component Hardware Group, Inc. are approved. Legs for cabinet base shall be 8" high, including feet. Freestanding sinks shall be supported on legs and feet as specified, with bracing from front to rear only.
5. Where flanged feet are specified, provide stainless steel flanged feet, which can be securely fastened to floor.

L. Casters
1. Shall be of 5" high roller bearing construction, swivel type with non-marking rubber tread. Two casters are to have locking type brakes. Wheels are to be disc steel type with neoprene tires. Casters shall be comparable in quality to Jarvis and Jarvis, Model No. 5-27-112 P, or Component Hardware.

M. Rough Edges:
1. All ends and edges which are rough or sharp shall be filed and ground to a safe smooth finish before delivery to job site.

2.3 LIST OF EQUIPMENT

A. Refer to Drawings for location of equipment.
1. NUMBER NOT USED

2. DISPOSER
   a. Provide 2 HP Disposer, Model No. 100-SA-3.5-ARSS∗C013, manufactured by Salvajor. Provide unit with standard finish and equipment.
   b. Unit to be furnished with the following accessories:
4. 3.5” Sink Collar.
5. Automatic Reversing Control Panel with Start-Stop buttons and stainless steel holding bracket securely mounted under table, where shown on Drawings. Panel to be provided with line disconnect switch.
6. Provide automatic turn-off water/energy accessory set for 10 minutes.
   c. Install unit in sink, of Item No. 29, Undercounter Dish Table, where shown on Drawings. Weld sink adapter to cut-out for waste.

3. HAND SINK

a. Provide Hand Sink with soap and paper towel dispenser, Model No. 7-PS-80*C013, manufactured by Advance Tabco. Provide unit with standard finish and equipment.

4. ICE MAKER WITH BIN
   a. Provide air cooled Ice Maker, Model No. QR-0420A*C013 manufactured by Manitowoc. Provide unit with standard finish and equipment, grommets, thermo-bulbs, and accessories for complete and functional installation.
   b. Provide unit with the following:
1. 6" Legs.
2. Water filter Assembly, Model No. 9320-13. Water filter to be installed in the incoming line.
3. Bin, Model No. Q-420
4. Crescent cube style.

5. SECURITY STORAGE
   a. Provide stationary Security Storage, Model No. SEC53C*C013, manufactured by InterMetro. Provide unit with standard finish and equipment.
   b. Provide unit with the following:
1. 66 13/16" high.

6. SHELVING MOBILE
   a. Provide Storage Shelving, Model BR Series*C013, Super Erecta, manufactured by InterMetro Industries Corp. Provide shelving with standard finish and accessories necessary to insure complete installation.
   b. Provide unit with the following:
1. Adjustable shelves, plastic split type sleeves.
2. Four BR Series posts, 86-5/8" high.
3. Four tiers.
4. Four casters, two with brakes.
5. Length and width to be as shown on Drawings.

7. BUN PAN RACK
   a. Provide universal angle Bun Pan Rack, Model No. 207-UA-13*C013, manufactured by Cres Cor. Provide unit with standard finish and equipment.
   b. Provide unit with the following:
1. Corner bumpers.

8. EXHAUST HOOD
   a. Provide Exhaust Hood, Model GX Series*C013, manufactured by Gaylord Industries. Ventilator to be a grease extractor type, UL listed, NSF approved, single-inlet style ventilator, to be sized as per Drawing. Grease extraction to be accomplished by a series of removable interior baffles inserts, with a grease extraction efficiency of at least 90%. All construction shall be of type 304 stainless steel.
   b. Ventilator shall be a high velocity centrifugal grease extractor, with the air inlet openings parallel to the cooking equipment being ventilated. The ventilator shall include "Custom Air" baffles to reduce the exhaust volume over specific cooking equipment as indicated on the plans. The ventilator shall operate at air quantities and static pressure as indicated on the plans.
   c. Ventilator shall contain one or more removable "extractor insets". Extractor inserts shall contain full-length self-draining baffles for grease extraction. Provide with

Extractor removal tool which allows operator to remove extractors from floor without moving equipment.

d. Furnish an electrically activated, spring-loaded, full length fire damper located in the exhaust plenum between extractors and duct collar. Fire damper to be controlled by an electronically actuated thermostat(s) located at the duct collar. The damper shall close each time the exhaust fan is turned off to prevent conditioned air from escaping through thermal shafts when ventilator is not in use.
e. Grease collecting gutter under extraction housing shall slope or incline to one (1) end to a removable stainless steel collection container and shall be concealed by a apron that runs the full length of the ventilator.
f. Ventilator shall be furnished with full length S/S hanger brackets. General contractor shall furnish 3/8" hanger rods, for brackets, to suspend hood from building joists, at front and at rear.
g. General contractor shall wire all switches, where shown.
h. The ventilator shall have an air supply plenum, with duct collar(s) and incorporate stainless steel perforated panels for front face make-up.
i. Ventilator to be furnished with recessed fluorescent light fixtures as shown on drawings. Lights to be factory pre-wired to a single point connection by the General Contractor. Ventilators built in multiple sections shall be furnished with coiled flex conduit for interconnecting sections.
j. Ventilator to be listed or recognized by BOCA, IMC, UMC, SBCCI and with all recommendations of NFPA Standard 96.
k. Provide factory pre-piping for Ansul R-102 fire protection system. Factory pre-piping to include piping, fuse links, and nozzles for duct and plenum protection. Pre-pipe main manifold on top of ventilator for appliance drops to terminate at the roof of the ventilator with hood penetration fittings and chrome plated 3/8” couplings.
l. Provide Ansul R-102 fire protection system to include chrome plated or sleeved piped system, micro switches, reset relay, gas valve as required, and UL listed hood penetration fittings per NFPA-96. Field hook-up. Permits, and certification of system as required by local code and authorities. Gas valve, shunt trip breakers, contactors and electrical disconnects to be provided by General Contractor.
m. Provide matching stainless steel enclosure panels between hood and finished ceiling. Provide stainless steel ceiling panels around perimeter of hood as required by local code.
n. Electrical Contractor to provide one switch for fan and one switch for lights.

9. ICE TEA DISPENSER
   a. This item is provided by Beverage Supplier.

10. POT RACK WALL SHELF
   a. Provide stainless steel Pot Rack Wall Shelf, Model No. SW-36*C013, manufactured by Advance Tabco. Provide unit with standard finish and equipment.
   b. Mount Pot Rack Wall Shelf 84” AFF.

11. CONVECTION OVEN
   a. Provide ful size Convection Oven, Model No. E35*C013, manufactured by Moffit/Turbofan. Provide unit with standard finish and equipment.
   b. Provide unit with the following:
      1. Stainless steel stand with casters, front two are locking, Model No. A26.

12. HOT PLATE
    a. Provide heavy duty open burner Hot Plate, Model No. IHPA-4-24*C013, manufactured by Imperial. Provide unit with standard finish and equipment.
    b. Provide unit with the following:
        1. Stainless steel stand with casters, front two are locking, Model No. IHPS-4-24.

13. GRIDDLE
    a. Provide heavy duty open burner Griddle, Model No. IMGA-3628*C013, manufactured by Imperial. Provide unit with standard finish and equipment.
    b. Griddle, to sit on Item No. 14, Equipment Stand, where shown on Drawings.

14. EQUIPMENT STAND
    a. Provide stainless steel Equipment Stand, Model No. ES-305*C013, manufactured by Advance Tabco. Provide unit with standard finish and equipment.
    b. Provide unit with the following:

1. Casters, front two are locking, Model No. TA-255.

15. FREEZER
    a. Provide reach-in Freezer, Model No. 1F*C013, manufactured by Continental Refrigerator. Provide unit with standard finish and equipment.

16. HEATED FOOD CABINET
    a. Provide insulated Heated Food Cabinet, Model No. H-137-UA-12C*C013, manufactured by Cres Cor. Provide unit with standard finish and equipment.

17. TWO COMPARTMENT SINK
    a. Provide fabricated, stainless steel Veg. Prep. Table W/Sinks, size and shape as shown on Drawings. Provide table with one drawer under right drain board and undershelf.
    b. Where shown on Drawings, cut out top to accommodate a two-compartment sink. Both compartments to be 14” deep. Paint exposed copper drain lines silver to match stainless steel table. Provide a chrome plated faucet, Model No. B-0231-EE*C013, with swivel 12”swing spout and B-0199-01 aerator, manufactured by T & S Brass and Bronze Works, Inc.
    c. Where adjacent to wall provide with a typical 8" high backsplash with 2" turnback on 45^{o} angle with enclosed welded ends. Front and sides to have marine edge. Refer to Drawing for typical tabletop construction details. Provide cut out in backsplash for faucet.

18. REFRIGERATOR
    a. Provide reach-in Refrigerator, Model No. 2R*C013, manufactured by Continental Refrigerator. Provide unit with standard finish and equipment.

19. TRASH RECEPTACLES
    a. This item is specified in the Millwork Section.

20. MICROWAVE
    a. Provide commercial Microwave oven, Model No. LD10D2*C013, manufactured by Amana.
    b. Microwave oven, to sit on Item No. 21, Work Table, where shown on Drawings.

21. WORK TABLE
    a. Provide flat top Work Table, Model No. MS-305*C013, manufactured by Advance Tabco. Provide unit with standard finish and equipment.

22. WORK TABLE WITH SINK
    a. Provide flat top Work Table with Sink, Model No. MS-305*C013, manufactured by Advance Tabco. Provide unit with standard finish and equipment.
    b. Provide unit with the following:
        1. Sink provision, Model No. TA-11H
        2. Deck mounted gooseneck faucet.
        3. Drawer.

23. HOT FOOD WELLS
    a. Provide individually controlled Hot Food Wells, Model No. CWIH-4*C013, manufactured by Atlas Metal Industries. Unit to have a 5" clearance underneath counter to allow room for the raised electrical outlet, where shown on Drawings.Provide unit with standard finish and equipment.
    b. Provide unit with the following:
        1. Tray slide, stainless steel, solid, ribbed, fold down.
        2. Protector case with fluorescent lights.
        3. Stainless steel undershelf.
        4. Individual drain for wach well with manifold to single valve.

24. FROST TOP
    a. Provide refrigerated Frost Top counter, Model No. CWRF-2*C013, manufactured by Atlas Metal Industries. Unit to have a 5" clearance underneath counter to allow room for the raised electrical outlet, where shown on Drawings. Provide unit with standard finish and equipment.
    b. Provide unit with the following:
        1. Tray slide, stainless steel, solid, ribbed, fold down.
        2. Double deck display case.

25. SALAD BAR
    a. Provide refrigerated Salad Bar, Model No. CWCM-4*C013, manufactured by Atlas Metal Industries. Unit to have a 5" clearance underneath counter to allow room for the raised electrical outlet, where shown on Drawings.Provide unit with standard finish and equipment.
    b. Provide unit with the following:
        1. Tray slide, stainless steel, solid, ribbed, fold down.
        2. Double deck display case.

26. FOUR COMPARTMENT SINK
    a. Provide stainless steel Four Compartment Sink with drainboard on right, Model No. 94-4-72-24R*C13, manufactured by Advance Tabco. Provide unit with standard finish and equipment.
    b. Provide unit with the following:
        1. Provide with four 2" lever operated drain with twist handle waste with built-in overflow, Model No. K-15.
        2. Provide two chrome plated faucets, Model No. B-0231-EE*C013, with swivel 12"swing spout and B-0199-01 aerator, manufactured by T & S Brass and Bronze Works, Inc.

27. UTILITY CART
    a. Provide medium duty Utility Cart, Model No. 422*C013, manufactured by Lakeside. Provide unit with standard finish and equipment.

28. UNDERCOUNTER DISHWASHER

a. Provide Undercounter Dishwasher, Model No. JPX-300H*C013, manufactured by Jackson. Provide unit with standard finish and equipment.
b. Provide unit with the following:
    1. 70 degree rise booster heater.
    2. One peg rack and one combination rack.

29. UNDERCOUNTER DISH TABLE
    a. Provide Undercounter Dish Table, Model No. UDT-4L-14/3-MOD*C013, manufactured by Eagle Group. Provide unit with standard finish and equipment.
    b. Provide unit with the following:
        1. Modify unit to be 74" long.
        2. Right to left operation.
        3. Pre-rinse unit.

30. COFFEE MAKER
    a. This item is provided by Product Supplier.

31. BEVERAGE TABLE
    a. Provide Beverage Table with single urn drain, Model No. CWU-5-MOD*C013, manufactured by Atlas Metal Industries. Provide unit with standard finish and equipment.
    b. Provide unit with the following:
        1. Modify unit to be 120" long.
        2. Tray slide, stainless steel, solid, ribbed, fold down.
        3. Designer series front rear skirt framed, recessed with casters.

32. SODA DISPENSER
    a. This item is provided by ProductSupplier.

33. NOT USED

34. JUICE DISPENSER
    a. This item is provided by Product Supplier.

35. TRAY/SILVER DISPENSER
    a. Provide self elevating Tray/Silver Dispenser, Model No. CWSB*C013, manufactured by Atlas Metal Industries. Provide unit with standard finish and equipment.

36. MOBILE WORK TABLE WITH OVERHSHELF
    a. Provide flat top Mobile Work Table with Overshelf, Model No. MS-305*C013, manufactured by Advance Tabco. Provide unit with standard finish and equipment.
    b. Provide unit with the following:
        1. Casters, front two with brakes.
        2. 15" deep overshelf.

37. CORNER GUARD
    a. Provide fabricated Corner Guard, size and shape as shown on Drawings.

38. DISH DISPENSER
    a. Provide enclosed two stack Dish Dispenser, Model No. CAB2-1013*C013, manufactured by Delfield. Provide unit with standard finish and equipment.

39. HOSE REEL
    a. Provide 50' Hose Reel, Model No. B-7242-01*C013, manufactured by T & S Brass and Bronze Works. Provide unit with standard finish and equipment.
    b. Provide unit with the following accessories:
        1. Anti-Spill Pressure Vacuum Breaker and Supply Kit, Model ORK- SK.
        2. Shut-off Control Valve, Model No. ORK-2.
        3. Mixing Valve, Model No. B-1035-ST.
        4. (2) B-CVV ½" Vertical check valves.
        5. Spray Valve, Model No. EB-0107.
    c. Mount hose reel per detail at 84" AFF.

2.4 MISCELLANEOUS ACCESSORIES

A. Water Filters: The water filters are to be installed in the incoming supply lines for specified items. Provide a shut-off valve before each filter in the water line. Verify installation requirements with the manufacturer.

B. Stainless Steel Ceiling Panels: Provide 20-gauge stainless steel ceiling panels around perimeter of the Exhaust Hood, Item No. 8. Panels shall extend a minimum of 18" away from Exhaust Hood. Verify actual panel sizes from architects reflective ceiling plan.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND INSTRUCTION BOOKLETS

A. At a time as designated by the Architect or Owners, demonstrate the operation, care, and minor maintenance of equipment supplied. Supply the Architect with an affidavit signed by the Owners or Food Service Manager/Director that this service was rendered and performed.

B. At the start of operation, devote one full working day monitoring all equipment operation. The purpose of this day is to insure equipment is in proper working order at start.

C. Submit to Owners at time of demonstrations two complete booklets, in hard binders, containing:
    1. Instructions.
    2. Warranties.
    3. Parts list of all bought out items provided under this section.
    4. List of names, addresses and telephone numbers of local authorized servicing agencies.
    5. Where available, provide videocassettes of all equipment specified. The videos are to show and detail proper care and maintenance of equipment.

3.2 FIELD MEASUREMENTS

A. Field measurements shall be made, giving due consideration to any Architectural, Mechanical, or Structural discrepancies which may occur during the construction of the building. No extra compensation shall be allowed for any difference between actual dimensions secured at the job site and the measurements indicated on the Contract Drawings.

B. Any differences that may be found during field measurements shall be submitted to the Architect for consideration before proceeding with the fabrication or supplying of any equipment.

3.3 INSTALLATION

A. Make arrangements for receiving equipment and make delivery into the building. Do not consign any equipment to the Owners or to any other Contractor unless written acceptance from them and satisfactory arrangements have been made for the payment of freight and all handling charges.

B. Deliver all equipment into the building, uncrate, assemble, level and repair any damaged or abraded surfaces. Set equipment temporarily in its final locations, permitting the mechanical and electrical trades to take necessary measurement for the connection of the service lines; then move the equipment sufficiently to permit the installation of such service lines. After which realign equipment level and plumb, making the final erection as shown on the Contract Drawings. All equipment shall be installed so as to eliminate objectionable vibration.

C. Contractor shall have a competent Food Service Equipment foreman on the premises to assist in furnishing information and supervising installation of Food Service Equipment under this section. This foreman shall verify correct locations for Rough-Ins.

3.4 LUBRICATION - OIL AND GREASE

A. Each moving part in the entire food facilities installation shall be provided with suitable bearings with provision for greasing, or with grease gun connections suited to a high-pressure gun for distributing heavy oil or light grease. Points of lubrication shall be readily accessible.

END OF SECTION 11 400

SECTION 12 484 - FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
1. Entrance mats in recessed frames.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for slab depression grouting and filling for recessed mats and frames.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show the following:

1. Divisions between mat sections.
2. Perimeter floor moldings.

C. Samples for Verification: For each type of product indicated.

1. Floor Mat: 12-inch- (300-mm-) square, assembled sections of floor mat.
2. Tread Rail: 12-inch- (300-mm-) long Sample of each type and color.
3. Frame Members: 12-inch- (300-mm-) long Sample of each type and color.

D. Maintenance Data: For floor mats and frames to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain floor mats and frames through one source from a single manufacturer.

B. Accessibility Requirements: Provide installed floor mats that comply with Section 4.5 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." Sections 302 and 303 in ICC A117.1.

1.5 PROJECT CONDITIONS

A. Field Measurements: Indicate measurements on Shop Drawings.

1.6 COORDINATION

A. Coordinate size and location of recesses in concrete with installation of finish floors to receive floor mats and frames.

PART 2 - PRODUCTS

2.1 ENTRANCE MATS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. American Floor Products Company, Inc.
2. ARDEN Architectural Specialties, Inc.
3. Balco, Inc.
4. Cactus Mat Mfg. Co.
5. Consolidated Plastics Company, Inc.
6. C/S Group.
7. Durable Corporation.
8. Flexco.
9. Matco International.
10. Mats, Inc.
11. Musson, R. C. Rubber Co.
12. Pawling Corporation; Architectural Products Division.
13. Sbemco International Inc.
14. Tennessee Mat Company, Inc.
15. Tepromark International, Inc.
16. U.S. Mat & Rubber Corporation.

B. Carpet-Type Mats: Nylon carpet bonded to 1/8- to 1/4-inch- (3- to 6-mm-) thick, flexible vinyl backing to form mats 3/8 or 7/16 inch (9.5 or 11 mm) thick with nonraveling edges.

1. Colors, Textures, and Patterns: As indicated by manufacturer's designations.
2. Mat Size: As indicated.

C. Recessed Frames:

1. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6061-T6 or Alloy 6063-T5, T6, or T52.
2. Color: Dark bronze As indicated by manufacturer's designations.
3. Architectural Bronze: ASTM B 455, Alloy UNS No. C38500.

2.2 CONCRETE FILL AND GROUT MATERIALS

A. Provide concrete grout and fill equivalent in strength to cast-in-place concrete slabs for recessed mats and frames. Use aggregate no larger than one-third fill thickness.

2.3 FABRICATION

A. Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.

B. Surface-Mounted Frames: As indicated for permanent surface-mounted installation, complete with corner connectors, splice plates or connecting pins, and postinstalled expansion anchors.

C. Recessed Frames: As indicated, for permanent recessed installation, complete with corner pins or reinforcement and anchorage devices.

1. Fabricate edge-frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.

D. Coat surfaces of aluminum frames that will contact cementitious material with manufacturer's standard protective coating.

2.4 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats and frames.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install recessed mat frames to comply with manufacturer's written instructions. Set mat tops at height recommended by manufacturer for most effective cleaning action; coordinate top of mat surfaces with bottom of doors that swing across mats to provide clearance between door and mat.
   1. Install necessary shims, spacers, and anchorages for proper location and secure attachment of frames.
   2. Install grout and fill around frames and, if required to set mat tops at proper elevations, in recesses under mats. Finish grout and fill smooth and level.

B. Install surface-type units to comply with manufacturer's written instructions at locations indicated; coordinate with entrance locations and traffic patterns.

   1. Anchor fixed surface-type frame members to floor with devices spaced as recommended by manufacturer.

3.3 PROTECTION

A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 12 484

SECTION 12 491 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Horizontal louver blinds with aluminum slats.

B. Related Sections include the following:

1. Division 6 Section "Miscellaneous Carpentry" for wood blocking and grounds for mounting horizontal louver blinds and accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each type and color of horizontal louver blind indicated.

1. Slat: Not less than 12 inches (300 mm) long.
2. Tapes: Full width, not less than 6 inches (150 mm) long.
3. Horizontal Louver Blind: Full-size unit, not less than 16 inches (400 mm) wide by 24 inches (600 mm) long.
4. Valance: Full-size unit, not less than 12 inches (300 mm) wide.
5. Cornice: Full-size unit, not less than 12 inches (300 mm) wide.

C. Product Certificates: For each type of horizontal louver blind, signed by product manufacturer.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for each type of horizontal louver blind.

E. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain horizontal louver blinds through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide horizontal louver blinds with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having

jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Flame-Resistance Ratings: Passes NFPA 701.

C. Product Standard: Provide horizontal louver blinds complying with WCSC A 100.1.

1. Mockups: Build mockups to verify selections made under sample submittals and to

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver horizontal louver blinds in factory packages, marked with manufacturer and product name, lead-free designation, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and dirty finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Horizontal Louver Blinds: Before installation begins, for each size, color, texture, pattern, and gloss indicated, full-size units equal to 5 percent of amount installed, but no fewer than 4 units.

PART 2 - PRODUCTS

2.1 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

1. Available Products: Subject to compliance with requirements, products that may be

B. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on DRAWINGS.

C. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radiused corners.

1. Width: 1/2 to 5/8 inch (13 to 16 mm).

a. Spacing: Not less than every 0.71 inch (18 mm).

2. Thickness: Manufacturer's standard.
3. Finish: One color.

a. Ionized Coating: Antistatic, dust-repellent, baked polyester finish.
b. Reflective Coating: Manufacturer's special coating enhancing the reflection of solar energy on the outside-facing slat surface.

D. Headrail: Formed steel or extruded aluminum; long edges returned or rolled; fully enclosing operating mechanisms on three sides and end plugs and the following:

1. Capacity: One blind per headrail.
2. Integrated Headrail/Valance: .
3. Light-blocking lower back lip.
4. Tilt limiter with preselected degree settings.

E. Bottom Rail: Formed-steel or extruded-aluminum tube, with plastic or metal capped ends top contoured to match crowned shape of slat; with enclosed ladders and tapes to prevent contact with sill.

F. Ladders: Evenly spaced to prevent long-term slat sag.

1. For Blinds with Nominal Slat Width 1 Inch (25 mm) or Less: Braided string.

G. Lift Cords: Manufacturer's standard.

H. Tilt Control: Enclosed worm-gear mechanism, slip clutch or detachable wand preventing overrotation, and linkage rod, and the following:

1. Tilt Operation: Manual with clear plastic wand.
2. Length of Tilt Control: Manufacturer's standard.
3. Tilt: Full.
4. Tilt: Two-direction, positive stop or lock-out limited at an angle of 75 degrees from zero-degree horizontal, both directions.

I. Lift Operation: Manual, cord lock; locks pull cord to stop blind at any position in ascending or descending travel.

J. Tilt-Control and Cord-Lock Position: Right side of headrail, unless otherwise indicated.

K. Valance: Manufacturer's standard.

1. Finish Color Characteristics: Match color, texture, pattern, and gloss of slats.

L. Mounting: Ceiling mounting, permitting easy removal and replacement without damaging blind or adjacent surfaces and finishes; with spacers and shims required for blind placement and alignment indicated.

1. Provide intermediate support brackets if end support spacing exceeds spacing recommended by manufacturer for weight and size of blind.

M. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.

N. Side Channels and Perimeter Light Gap Seals: Manufacturer's standard.

O. Colors, Textures, Patterns, and Gloss: As indicated in on finish drawings and legend.

2.2 HORIZONTAL LOUVER BLIND FABRICATION

A. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.

1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.

B. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):

1. Blind Units Installed between (inside) Jambs: Width equal to 1/4 inch (6 mm) per side or 1/2 inch (13 mm) total, plus or minus 1/8 inch (3.1 mm), less than jamb-to-jamb dimension of opening in which each blind is installed. Length equal to 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm), less than head-to-sill dimension of opening in which each blind is installed.

C. Installation Brackets: Designed for easy removal and reinstallation of blind, for supporting headrail, valance, and operating hardware, and for hardware position and blind mounting method indicated.

D. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to blind hardware and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.

E. Color-Coated Finish:

1. Metal: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

F. Component Color: Provide rails, cords, ladders, and exposed-to-view metal and plastic matching or coordinating with slat color, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install horizontal louver blinds level and plumb and aligned with adjacent units according to manufacturer's written instructions, and located so exterior slat edges in any position are not

closer than 1 inch (25 mm) to interior face of glass. Install intermediate support as required to prevent deflection in headrail. Allow clearances between adjacent blinds and for operating glazed opening's operation hardware if any.

B. Head Mounted: Install headrail on face of opening head.

3.3 ADJUSTING

A. Adjust horizontal louver blinds to operate smoothly, easily, safely, and free of binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean horizontal louver blind surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.

C. Replace damaged horizontal louver blinds that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION 12 491

SECTION 12 494 - ROLLER SHADES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manually operated sunscreen roller shades.

1.2 RELATED SECTIONS

A. Section 06100 - Rough Carpentry: Wood blocking and grounds for mounting roller shades and accessories.

B. Section 09260 - Gypsum Board Assemblies: Coordination with gypsum board assemblies for installation of shade pockets, closures and related accessories.

C. Section 09510 - Acoustical Ceilings: Coordination with acoustical ceiling systems for installation of shade pockets, closures and related accessories.

1.3 REFERENCES

A. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. NFPA 701-99 - Fire Tests for Flame-Resistant Textiles and Films.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
   3. Storage and handling requirements and recommendations.
   4. Mounting details and installation methods.

C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.
   1. Prepare shop drawings on Autocad or Microstation format using base sheets provided electronically by the Architect.

D. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.

E. Selection Samples: For each finish product specified, one set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.

F. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shadecloth sample and aluminum finish sample as selected. Mark face of material to indicate interior faces.

G. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years experience in manufacturing products comparable to those specified in this section.

B. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.

C. Fire-Test-Response Characteristics: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.

D. Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645.

E. Mock-Up: Provide a mock-up (manual shades only) of one roller shade assembly for evaluation of mounting, appearance and accessories.
   1. Locate mock-up in window designated by Architect.
   2. Do not proceed with remaining work until, mock-up is accepted by Architect.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 WARRANTY

A. Roller Shade Hardware, Chain and Shadecloth: Manufacturer's standard non-depreciating twenty-five year limited warranty.

B. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: MechoShade Systems, Inc.; 42-03 35th Street, Long Island City, NY 11101. ASD. Tel: (718) 729-2020. Fax: (718) 729-2941. Email: info@mechoshade.com www.mechoshade.com

B. Substitutions: Refer to Section 01 630 Products and Substitutions.

2.2 APPLICATIONS/SCOPE

A. Roller Shade Schedule:
   1. Shade Type 1: Manual operating, chain drive, sunscreen roller shades in all exterior windows of rooms and spaces shown on the Drawings.

2.3 SHADE CLOTH

A. Visually Transparent Single-Fabric Shadecloth: MechoShade Systems, Inc., ThermoVeil group, single thickness non-raveling 0.030-inch (0.762 mm) thick vinyl fabric, woven from 0.018-inch (0.457 mm) diameter extruded vinyl yarn comprising of 21 percent polyester and 79 percent reinforced vinyl, in colors selected from manufacturer's available range.
   1. Open Linear Weave: "1800 series", 15 percent open, linear-weave pattern.
   2. Color: Selected from manufacturer's standard colors.

2.4 SHADE FABRICATION

A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.

B. Fabricate shadecloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch (3.18 mm) in either direction per 8 feet (2438 mm) of shade height due to warp distortion or weave design. Fabricate hem as follows:
   1. Bottom hem weights.
   2. Concealed hemtube.

C. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shadebands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

2.5 COMPONENTS

A. Access and Material Requirements:
   1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
   2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
   3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester will not be acceptable.

B. Manual Operated Chain Drive Hardware and Brackets:
   1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
   2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
   3. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
   4. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
   5. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
   6. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable
   7. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
   8. Drive Bracket / Brake Assembly:
      a. MechoShade Drive Bracket model M5 shall be fully integrated with all MechoShade accessories, including, but not limited to: SnapLoc fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades.
      b. M5 drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch (9.525 mm) steel pin.
      c. The brake shall be an over -unning clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. (22 kg) in the stopped position.
      d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.

e. The entire M5 assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.

C. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.

2.6 ACCESSORIES

A. Fascia:
1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
2. Fascia shall be able to be installed across two or more shade bands in one piece.
3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
5. Notching of Fascia for manual chain shall not be acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

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

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow proper clearances for window operation hardware.

B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

D. Engage Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 12 494

SECTION 15 010 - MECHANICAL GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 INTERPRETATION OF SPECIFICATIONS:

A. General provisions and requirements apply throughout. Cross-references or general provisions may be repeated for convenience or emphasis only.

B. Interpret the following as indicated:

1. "or equal": "in accordance with the General Conditions", or "an equivalent with respect to style and function."
2. "approved": "approved or accepted by Governing Officials or the authorities having jurisdiction".
3. "provide": "furnish and install, connect, and test, and contract for the performance of same."
4. "wiring": "required conductors or cable and raceway system, including fittings, boxes, connectors, supports, hardware, labeling, and miscellaneous related accessories."
5. "work": "materials completely provided," which shall include all activities and services necessary to meet contract requirements, including inspection and replacement as specified of any defective element."
6. "materials": "equipment and/or materials."
7. ": " : "shall be/have" Specifications following a colon are criteria which apply to the term preceding the colon.

1.2 SUBSTITUTIONS:

A. Utilize only those materials specifically listed by the Contract Documents. Substitutions of alternative types of major materials will not be acceptable unless a written "prior" acceptance is obtained. Requests for prior acceptance of alternative materials must conform to the procedures for submitting shop drawings and product data.

B. The design and layout shown on the plans are based on the manufacturer indicated on the equipment schedule. If equipment other than that used as the basis of design is submitted for use on this project, it shall be the responsibility of the Contractor to submit a revised drawing of the layout, showing the location, clearances for access and service. Changes to architectural, structural, electrical, mechanical, ductwork, or plumbing systems shall be the responsibility of the contractor, including costs for redesign of these systems. Submittals shall clearly indicate any required changes to the building systems affected by substitution of equipment.

1.3 GENERAL SCOPE OF WORK:

A. The Contract Documents establish the basic systems designs and the detail design of the work, or establish systems or materials performance criteria and minimum design requirements. In either case, certain aspects of the work or of the detail design are not established completely. Establish said work and details in accordance with industry norms and practice to suit the needs of the job. The work shall provide for complete systems and services unless otherwise specified herein.

B. Division 15 will be responsible to carry out the commissioning requirements specified in Section 15995, 17100 and other sections referenced in 17100.

C. The work covered by this specification shall include furnishing supervision, labor, supplies, materials, equipment, tools, services, taxes and dollar costs required to construct and install the complete mechanical systems as specified herein and as shown by the plans and other relevant documents. Without limiting the generality thereof, the major items of the work are:
1. Utility connections and metering, including temporary connections.
2. Heating, Ventilation, and Air Conditioning system.
3. Plumbing system, including potable water and sanitary sewer.
4. Gas piping system.
5. Fire protection sprinkler system.
6. Control systems and wiring for systems provided.
7. Specialty systems as specified or shown by plans.
8. Special tools for maintenance or inspection of materials.
9. Necessary services and support work, including scaffolding, and hoisting.
10. Permits, inspection fees, approvals, licenses, registrations, certificates, taxes, and specified or miscellaneous dollar costs.
11. Shop Drawings and Product Data Submittals as specified.
12. Inspections, tests, and systems and equipment demonstrations.
13. Documentation and notifications.
14. Materials transportation, delivery, handling, storage, protection, guarding and inspecting.
15. Instruction of Owner's Operating and Maintenance Personnel.
16. Temporary utility and site distribution system(s).
17. Demonstration of completion of the work.
18. Replacement of Defective Work.

1.04 CODES AND STANDARDS:

A. The mechanical installation, equipment, materials and workmanship shall as a minimum is in accordance with the requirements and recommendations of the latest edition of the following:
1. International Building Code.
2. International Plumbing Code (Georgia Amendments).
3. Heating, Ventilation and Air Conditioning:
   International Mechanical Code (Georgia Amendments)
   The Georgia State Energy Code for Buildings
   NFPA 90A and NFPA 96
4. Gas installation:
   International Gas Code,(Georgia Amendments)
   AGA and NFPA standards
   Regulations of the Gas Company.
5. The fire protection system: NFPA 13.
6. Applicable federal, state, and local laws, codes, ordinances, and rulings of Governing Officials having jurisdiction.
7. Utility and service company regulations and requirements.
8. All equipment and materials shall be mounted and braced as required for Seismic Zone 2 requirements.

B. Codes and standards cited establish only the minimum requirements for the work. Where requirements of the Contract Documents exceed requirements of the Codes and Standards, provide the work in accordance with the express requirements of the Contract Documents.

Do not reduce the quality of the design or eliminate future capacity or options without acceptance by the Engineer, even if proposed changes meet minimum Code requirements.

C. The latest edition of the specifications, standards, and listings of the following organization are made a part of this specification. Mechanical work, unless otherwise indicated, shall comply with their requirements and recommendations wherever applicable:
   1. Underwriter's Laboratories, Inc. (UL)
   2. National Fire Protection Association (NFPA)
   3. American National Standards Institute (ANSI)
   4. American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE)
   5. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

1.5 COMPLIANCE OF WORK WITH CODES AND ORDINANCES:

A. Comply with the requirements of local ordinances and Codes as modified and amended by Governing Officials having jurisdiction.

B. Notify the Architect in writing of any instance where any requirement of the Contract Documents is in conflict with any Code or ordinance, so that any required changes may be made in a timely manner and without the need for remedial work. Do not perform work contrary to Codes, ordinances, regulations, or rulings of Governing Officials.

1.6 RELATED WORK IN OTHER DIVISIONS:

A. The following work is generally specified by other Divisions of specifications:
   1. Temporary water supply and temporary sanitary convenience.
   2. Fire extinguisher and fire extinguisher cabinets.
   3. Toilet accessories.
   4. Foundation drain tile.
   5. Catch basins or manholes.
   6. Installation of building access panels and plaster frames.
   7. Flashing and Pitch pockets for roof mounted equipment.
   8. Roof openings and outside wall openings.
   9. Cutting and patching of structural elements, walls, floors, ceilings, or roof.
   10. Structural platforms.
   11. Louvers and screens.
   12. Building access panels.
   13. Painting.

B. Electrical power work is covered by Division 16 specifications, including the following:
   1. Installation of individually mounted motor starters, controllers (starters), contactors, and related power wiring.
   2. Power wiring of motors, heaters, fans, etc. and furnishing, installation and wiring of individually mounted safety switches.

C. Refer to the General Conditions for requirements for submittals, training, and guarantees.

1.7 PERMITS AND COSTS:

A. Obtain and pay for permits, assessments, taxes, fees, licenses, etc. necessary for the installation of the work. Deliver to the Owner all such certificates of inspection or occupancy issued by Governing Officials.

1.8 SHOP DRAWINGS AND PRODUCT DATA:

A. Submittals:

1. Fully in accordance with and consistent with the General Conditions, and with the requirements of the technical specifications and plans.
2. Include catalog cuts, bulletins, plates, drawings, diagrams, schedules, and any other information as necessary to indicate the relative characteristics, ratings, and capacities of the respective items of equipment.
3. Clearly and fully state any technical exceptions in one place.
4. Check for accuracy and coordinate between the involved trades before submission for review and acceptance by the Engineer.
5. Check electrical service for any equipment requiring power to ensure that equipment submitted matches the power systems for the project, including voltage and phase.

B. Shop Drawings:

1. Prepare shop drawings, of a scale not less than that of the contract plans, giving locations for major equipment, ductwork, and piping, based on equipment to be installed.
2. Show the location and weight of each item of roof mounted equipment, roof openings, pads, sleeves, anchor bolts, etc.,
3. Show all clearances recommended by the manufacturer for the service or removal of equipment/ materials.
4. Notify the Architect in writing where shop drawings indicate elevations of piping or ducts, which would place pipe, or duct below lighting fixtures or ceilings, or that would require the lowering of lighting fixtures or ceilings.
5. Coordinate the structural, architectural and systems changes required for the mechanical equipment actually used on the project.
6. Submit sheet metal shop drawings, based on field measurements of actual conditions and the equipment submitted and approved for this project. Sheet metal shop drawings shall clearly indicate all changes required to accommodate actual field conditions such as interference with structural or other building elements and systems.

C. Each shop drawing, product data sheet, catalog cut, etc. submitted shall bear on its face an acceptance date and signature of the Contractor, indicating that the submission has been checked and accepted for installation by the Contractor.

D. The Engineer's review of shop drawings and product data shall not change the requirements of the contract documents, nor shall this review relieve the Contractor of full responsibility for any and all errors or omissions in said documentation.

E. Submit shop drawings and product data for review for major systems and materials, including:

- Cleanouts
- Domestic Water Heaters
- Grease Traps
- Floor and Roof Drains
- Plumbing Fixtures and Accessories
- Plumbing Specialties
- Wall Hydrants
- Fire Protection System Layout (at same scale as the mechanical floor plans)
- Sprinkler Heads
- Fire Protection System Appurtenances (compressors, valves, etc.)
- Air Distribution Products and Accessories

- Air Conditioning and Heating Units with coil, fan, filter, and compressor data
- Condensing Units
- Dampers
- Duct Furnaces
- Duct Lining
- Ductwork and accessories
- Electric Heating Units
- Electric Heating Coils
- Equipment Layout Drawings
- Fans (with curves for fans 1/2 HP and larger)
- Fan Coil Units
- Flexible Ductwork
- Insulation (duct and pipe)
- Louvers and Screens
- Motor Controls
- Refrigerant Piping Diagrams
- Refrigerant Piping Specialties
- Sheet Metal Work
- Temperature Control System including control diagrams, control panel layouts, descriptions of operation and cuts of instruments
- Valves and piping specialties
- Variable Volume Devices

1.9 DOCUMENTATION, MANUALS AND RECORD PLANS:

A. Prepare manuals containing certificates or letters of warranty or guarantee, operating and maintenance instructions and recommendations, test results, and other data specified herein, and deliver the manuals to the Owner's Representative upon completion of the work. These manuals shall include information on major materials (such as major equipment) and on special systems or materials. Any special tools required for service or repair shall be listed.

B. Manuals:
1. Ring binders with the name of the manual, project, Architect, Engineer and Contractor placed on the cover of each manual.
2. Each manual shall contain a table of contents listing the items contained therein by number and name. Each item shall be properly indexed with a standard metal reinforced cover page tab, with item number and name printed on tab per se.

C. Provide Installation, Operation, and Maintenance (IOM) Manuals for major materials (equipment) in separate manuals, or sets of manuals, for each major system or item of material. IOM Manuals shall contain the following items of information:
1. Manufacturer's maintenance and operation recommendations.
2. Final (corrected) shop drawings and product data information.
3. As-built control diagrams.
4. Step-by-step starting and stopping procedures for each major item of equipment and related system.
5. Service telephone number of any installing Equipment Supplier or Manufacturer.
6. Executed Guarantee/ Warranty Cards and related beginning and ending period dates for each item of material/equipment.

D. Make written certification to the Architect that tests, checks, verifications, and settings have been satisfactorily completed. Where any item cannot be certified as correct, make a written

report of the relevant facts and test data.

E. Have bonds, guarantees, receipts, affidavits, etc., called for in the various specification articles prepared and signed in advance of final demonstration of completion and acceptance of the work. Deliver to the Architect at or before the time of inspection with a letter of transmittal, listing each item included.

F. On a set of contract documents, maintain an accurate record of all deviations made during the progress of the work from the contract documents (plans and specifications). Also, maintain an accurate as-built record of the dimensional locations of outside underground materials such as meters, valves, and incoming utility lines, piping, or conduits. The marked-up (record) documents shall be available on the site for inspection during normal working hours.

1.10 SCHEDULING AND CONDUCT OF THE WORK:

A. Perform work on schedule and in a manner as described by the Special Conditions of the Specifications and by Division 15 specifications. Plan, coordinate, and execute the work to meet building schedules and so as not to produce interference between the work of the various trades, or with any special job site construction.

B. Specified tests may be witnessed by the Architect or Engineer, at their option. Provide at least five (5) days notice to the Architect of each test schedule, so that the Architect and Engineer may plan to attend the test if desired.

C. The Architect or Engineer may inspect the site at any time, at their option. In order that they may plan to inspect the job after the installation of major materials and before the materials are enclosed from ready view, notify Architect at least five (5) days in advance of the following construction milestones:
* Underground piping installed, but prior to slab being placed or trenches backfilled.
* Ductwork or piping installed, but before installation of walls or dropped ceilings, and before application of any insulation.

1.11 TRANSPORTATION AND DELIVERY:

A. Provide and pay for the transportation, storage and handling of materials. Materials shall be delivered to the job site in ample quantities to provide for the uninterrupted progress of work as scheduled. Where necessary, provide expedited or special shipping or handling of materials to prevent interruption of the overall job progress.

1.12 SPECIALIZED SERVICES:

A. Provide any necessary specialized services, such as accredited direct factory representative, as may be required for survey, inspection, supervision, installation, calibration, test, placing of equipment into operation, or for trouble shooting during the period of replacement of defective work.

B. Provide for the installation of control systems and related low voltage (generally 50 volts or less) wiring for the building systems covered by Division 15 specifications. Control systems and wiring shall meet the requirements of Division 16 specifications.

1.13 GUARANTEES / WARRANTIES:

A. Leave the entire mechanical system installed under this contract in proper working order. Replace any work or material, which develops defects, except from ordinary wear and tear, within one (1) year from the date of beneficial acceptance by the Owner.

B. Air Conditioning Compressors: a one (1) year manufacturer's guarantee against defective parts and labor, and an additional four (4) year manufacturer's guarantee on the compressor for replacement of parts only. For these compressors, the period for replacement by the Contractor of defective work shall be extended an additional four (4) years for services related to securing parts only.

C. The materials of the mechanical systems shall have the manufacturer's and/or supplier's guarantee or warranty put into effect by execution and filing of any and all related papers. For one (1) year from the date of acceptance, obtain service or repair under the terms of any said guarantee or warranty in the Owner's behalf.

PART 2 PRODUCTS

2.1 MATERIALS:

A. Equipment and materials: new, of the best quality and grade of the relative quality established, of manufacturer's standard, established product line. Where applicable standards are established, shall conform to National Board of Fire Underwriter's requirements and bear the seal of approval of a recognized and approved testing agency, as accepted by the Engineer.

B. Consistently maintain a product line throughout the entire installation.

C. Equipment and components that interact to form equipment assemblies and/or systems shall be of the same manufacturer to the greatest extent possible.

2.2 BUILDING ACCESS PANELS:

A. Building access panels:
   1. Metal construction with hinged door and an inconspicuous frame
   2. Size required to provide proper access for maintenance and service, with a minimum size of 18 X 18-inches.
   3. "B" label where installed in rated walls.

B. Milcor "DW", or equal, for drywall locations and Milcor "K", or equal, elsewhere.

2.3 PAINT:

A. Paint used for touching up factory painted apparatus shall be top quality and selected to match the factory finish.

B. Cold galvanizing compound: Sherwin-Williams "Zinc-Clad Primer" or equal.

C. Rust Preventative paint: "Rust-Oleum" or equal.

2.4 MOTOR CONTROLLERS AND ACCESSORIES:

A. Provide motor controllers for all motors specified under Division 15.

B. Motor controllers: General Electric, Allen Bradley Co., Allis-Chalmers Manufacturing Co., Westinghouse Electric Corp., or Cutler-Hammer.

C. Motors 1/2 H.P. and larger: Full voltage magnetic starters with three (3) overloads shall be in combination with a properly sized three (3) pole molded-case circuit breaker, and 120 V. control transformer with fused primary leads and hot secondary lead, all in a N.E.M.A. 1 enclosure unless installed exposed to weather, then N.E.M.A. 3R enclosure. Furnish auxiliary contacts and interlocks as required for control functions.

D. Motors 1/3 H.P. and smaller: Magnetic starters where required for automatic control, otherwise furnish manual starters. Where motors have built in thermal overload protection furnish contactors for automatically controlled motors and motor rated toggle switches for manually controlled motors.

E. Provide motor control accessories such as pilot lights, pushbuttons and selector (H-O-A) switches as a part of the apparatus, which they operate, located in the starter cover. Automatically controlled equipment shall be furnished with a "Hand-Off-Auto" switch and pilot light; manually controlled equipment shall be furnished with "On-Off" switch and pilot light.

F. Starters and electrical control devices other than those located in mechanical rooms, control panels, and storage rooms: flush mounted type with locking covers.

G. Nameplates:
   1. Engraved laminated bakelite panel, secured with screws.
   2. Provide a nameplate identifying the equipment served for starter, pushbutton station, and thermal overload switch.

2.5 ELECTRICAL MATERIALS:

A. Electrical materials: Division 16 specifications.

PART 3 EXECUTION

3.1 GENERAL DESIGN AND WORK:

A. Read and study relevant documents, including Codes. Become familiar with the site, the scope of work and services, type of general construction, and the civil, structural,

architectural, interior design, mechanical, electrical and special system plans and specifications.

B. Establish design and work details to provide for the complete installation of materials and the successful operation of systems. Notify the Engineer in writing, in a timely manner if responsibilities or directions are not clear, or if assistance is desired in determining the needs or requirements for any particular item.

3.2 INTERFERENCES AND COORDINATION:

A. The plans showing mechanical work are generally diagrammatic in nature. The plans shall not be scaled for any dimension.

B. Coordinate the work with that of different trades so that interferences between the mechanical work and other work will be avoided. Refer to building plans for guidance as to dimensions, finished grades, ceiling heights, door swings, room finishes, location of ducts, pipes, equipment, outlets and similar details that are required, and coordinate final installation with work as actually installed. Outlets and connections for equipment or devices to be installed by different trades shall be coordinated to assure that the outlets and connections are properly sized and located with respect to the equipment served and the surrounding areas.

C. Offsets and fittings in lines, and adjustments to equipment and fixture locations, as accepted by the Owner's representative, shall be provided to accomplish the work in a satisfactory manner.

D. If interference develops, the Owner's representative shall decide which item of equipment, ductwork, piping, conduit, etc. must be relocated, regardless of the sequence of installation of the affected items.

3.3 SPACE REQUIREMENTS:

A. Materials:
1. Fit into the space provided in the building or property.
2. Install at such time and in such manner as to avoid damage to the building structure or property
3. Install as required by the job progress.

B. Materials requiring normal servicing or maintenance shall be made easily accessible, including associated connection devices, wiring and/or piping.

C. Ductwork, piping, raceways, and supports
1. Maintain as close as possible to walls, floor slabs, columns, etc., so as to take up a minimum amount of space. Provide offsets and fittings required to accomplish this.
2. Do not be locate within 42-inches of switchboards, panelboards or motor control centers, including the space horizontally from the electrical equipment , and the space from floor to structural ceiling over electrical equipment.
3. Conceal in public or finished spaces.

3.4 WORKMANSHIP:

A. Workmanship:
   1. Of the highest quality.
   2. No substandard work will be accepted.
   3. Work shall be done by workmen skilled in the trade involved.

3.5 PROTECTION OF MATERIALS AND EQUIPMENT:

A. Protect materials from the elements and other causes of damage during shipment, storage, and erection, until final acceptance by the Owner.

B. During construction, cover the fronts of equipment to prevent marring or defacing.

C. Close open ends of ductwork, pipe, or conduit with temporary closures or plugged when work is stopped, to prevent debris from entering.

D. Install filters in air handling systems before any operation of the system. Exhaust fans may be protected using temporary filters cut from roll media and fastened over air inlets.

3.6 INSTALLATION OF MATERIALS:

A. Install materials
   1. In accordance with the manufacturer's published recommendations for installation
   2. In accordance with any listing restrictions of a certifying laboratory or agency
   3. In accordance with the requirements of involved Government Agencies or local Governing Officials.

B. Materials: set level, square and plumb, properly oriented, aligned and secured in the location indicated.

C. Lock washers: install under nuts, which bear on metal.

D. Surfaces to be painted shall be clean and free of dirt, dust, oil and rust.

E. Where galvanizing is broken during fabrication or installation (including tack welding), recoat exposed areas with cold galvanizing compound.

F. Paint exposed iron or steel materials such as ductwork, piping, conduits and supports (but not equipment, devices, and components), including those exterior to the building, where exposed to view without removing ceilings or access panels with one coat of rust inhibiting paint. The type and color of paint shall be acceptable to the Architect.

G. Paint materials and supports above ceilings, but visible through grilles or diffusers, etc., flat black unless inappropriate due to listing restrictions or function.

3.7 BUILDING ACCESS PANELS:

A. Provide building access panels where required to provide access for service and maintenance for equipment, fans, heaters, ductwork, damper operators, valves, traps, instruments, etc., including associated connection devices, wiring and/or piping. In general, only one (1) access panel shall be provided for an item of equipment and associated connecting devices, wiring and/or piping. Where feasible one access panel may serve several items of equipment.

B. Coordinate access panel location and size with materials/ equipment served to allow for installation, operation, inspection and maintenance as necessary, including testing and recalibrating. Access panels for fire dampers and/or duct smoke detectors shall allow resetting of the dampers and/or detectors.

C. Access panels are not required for materials above lay-in (push-up) ceiling systems.

3.8 EQUIPMENT FOUNDATIONS:

A. Concrete foundations or bases as required shall be provided and coordinated with the job. Furnish anchor bolts and other accessories required for casting in concrete bases, and also furnish proper templates and dimensions for casting bases and setting of sleeves or anchor bolts, or for core drilling of necessary holes.

B. Equipment mounting pads (housekeeping pads) shall be reinforced and secured to the floor; equipment shall be secured to the pads. Pads shall be sized to suit the application, based on equipment outlines and mounting base dimensions. Necessary block-outs or hardware for connections, drain lines, bolts, etc. shall be provided to suit the application.

C. Each item of floor mounted mechanical equipment, including fans and pumps, shall be installed on a 6-inch high concrete pad.

3.9 SUPPORTING DEVICES AND MATERIALS:

A. Provide supports for properly mounting materials. Supports shall provide adequate and rigid mounting for materials. Supports shall be fabricated and installed in a neat and workmanlike manner, and care shall be taken that at no time shall any portion of the building structure be overloaded or weakened.

B. Unless otherwise indicated, select and size foundations, supports, and fasteners.

3.10 CUTTING AND PATCHING:

A. Coordinate with the various trades sufficiently ahead of the construction of any floor, wall, ceiling, roof, or other element, and identify openings, foundations, pads, curbs, and inserts that will be required for the work. Do not cut any structural member without having received written permission from the Architect.

3.11 CLEANING:

A. Clean equipment, fixtures, devices and other materials furnished or set in place. Remove plaster, paint, stickers, rust, stains, and other foreign matter or discoloration. Surfaces shall be polished and free of paint, oil, grease, and other dirt and debris. Touch up or refinish materials, which have been damaged or marred during the construction process.

3.12 LUBRICATION:

A. After installation of equipment, motors and equipment components, lubricate as recommended by the manufacturer.

3.13 MARKING AND LABELING:

A. Provide marking and labeling for major items of equipment, controls, and materials.

B. Stencil air conditioning units and fans with system numbers in a prominent location using minimum size 2-inch high block letters.

3.14 CHECKS AND TESTS:

A. Make tests as reasonably required by the Engineer to prove the integrity of the work, and leave the complete installation in first class condition and ready for operation.

B. Thoroughly test and demonstrate individual systems to meet full functional requirements.

C. See other sections of the specifications for specific testing requirements.

END OF SECTION 15 010

SECTION 15 060 - PIPING, VALVES AND SPECIALTIES

PART 1 GENERAL

1.1 DESCRIPTION:

A. Provide piping for plumbing, natural gas, and heating and air conditioning equipment in accordance with the provisions of this section of the specifications.

PART 2 PRODUCTS

2.1 PIPING SYSTEM CLASSIFICATION:

A. Piping systems are classified as follows with materials and methods of construction:

1. Class 1:
   a. Systems (above ground, 2 inch and smaller size):
      * Air conditioning condensate drains
      * Domestic cold water
      * Domestic hot water
   b. Pipe: Type "L" hard drawn copper tubing, A.S.T.M. Specification B-88.
   c. Construction: suitable for a water pressure of 200 lbs. at 200^{o}F.
   d. Joints: "sweat" type construction using 95-5 solder and a suitable non-corrode paste or approved equal soldering system.
   e. Fittings: sweat type wrought copper fittings conforming to ANSI B16.22.
   f. Valves: all brass or bronze solder ends for 125 lbs. steam working pressure. Valves shall be as follows:

Valve type	Nibco Inc.
Gate	S-111
Globe	S-235-Y
Check	S-413(BWY)

   Equal by Crane, Hammond, Jenkins, Lunkenheimer, Powell, Stockham, Walworth.

2. Class 2:
   a. System: Domestic cold water below ground.
   b. Construction: suitable for a water pressure of 200 psig, at 200 ^{o}F.
   c. Pipe: Pipe shall be Type "K" tubing conforming to A.N.S.I. B-23.1.
   d. Joints: "sweat" type construction using 95-5 solder and suitable non-corrode paste.
   e. Fittings: soft copper type conforming to A.N.S.I. B-16.22. Do not locate joints below floor slabs.

3. Class 3:
   a. Systems:
      * Plumbing waste, vents, and drains.
      * Interior storm drainage
   b. Construction: comply with requirements of plumbing and building "Code" for pressure rating and design.
   c. Pipe Below Grade: Service weight cast iron sanitary pipe with hub using neoprene gasket fittings conforming to C.I.S.P.I. 301

d. Pipe Above Grade: Service weight cast iron sanitary pipe with no-hub fittings. Dry vents above ground may be schedule 40 galvanized steel pipe.
e. Fittings: No hub system. Urinal connections shall be iron pipe size brasspipe and cast brass screwed fittings.
f. Option: Type 1, schedule 40 PVC pipe conforming to ASTM D-1785 may be used for waste and vent piping not located in air plenum areas, if approved by local code inspectors. Fittings shall be PVC drainage type conforming to ANSI 119.1

4. Class 4:
   a. Systems:
      * Natural gas
      * Interior above ground storm drainage.
   b. Construction: suitable for a steam working pressure of 125 lbs.
      * 2 inch and smaller: screwed construction with screwed valves.
      * 2-1/2 inch and larger: welded construction with welded flanges at the valves, specialties, and disconnect points.
      * Natural gas piping located in concealed space: welded construction
   c. Pipe: schedule 40 black steel conforming with A.S.T.M. A-120.
   d. Fittings:
      1. Fittings 2 inch and smaller: cast iron threaded 125 lbs. A.N.S.I. B16.4.
      2. 2-1/2 inch size and larger: long radius, steel, butt welding type, schedule 40, A.N.S.I. B16.9 and A.S.T.M. A234, unless noted to be the flanged type which shall be 125 lbs. cast iron. All flanges shall be 150 lbs. or 300 lbs. forged steel welding neck type with flat and raised faces to match adjacent valves and flanged fittings.
      3. Connections to roof drains: screwed.
   e. Gas cocks shall be as listed for natural gas, Powell 948 1/2" and smaller. Powell 2202 3/4" and larger.
   f. Alternate Construction: interior above ground storm drainage may be cast iron soil pipe as specified in Class 2.

2.2 PIPE SLEEVES, FLOOR, WALL AND CEILING PLATES:

A. Sleeves for pipes passing through walls, floors, concrete slabs, etc.,:
   1. Schedule 40 steel pipe.
   2. Proper diameter to allow pipes to pass through easily, with not less than 1/4 inch space between pipe on bare lines and insulation on insulated lines and sleeves.
   3. Full thickness of wall or slab.

B. Sleeves for exposed piping in floors and/or slabs shall extend a minimum of three (3) inches above finished floors. Do not cut or sleeve beams, footings or structural members without prior written approval of the Architect.

C. Sleeves through roof slabs: Josam series 26400 caulk type or 26420 screw type or equal Wade, Zurn or Smith.

D. Sleeves through foundation walls: cast iron pipe. Footings shall be lowered to permit piping to pass through foundation walls. Before lowering footings, notify Architect in writing with

specific details.

E. Provide chromium plated escutcheons for exposed piping in finished areas passing through walls, floors, and ceilings. Escutcheon plates shall be not less than #20 gauge steel and shall be held in place with springs. Plates shall be sized to cover sleeve and fit over insulation.

2.3 FLASHING:

A. Pipe passing through a roof: flashed and watertight.

B. Perform cutting and repairing of roofing by qualified roofers. Leave roofing in equal condition as existed before the roofing was cut.

C. Caulk at least a one foot extension of cast iron pipe into each vent connection above hub in which lead flashing is caulked or turn lead down into no hub pipe after extending pipe a minimum of 8 inches above roof.

D. Where pipes, other than plumbing, pass through roof, they shall be flashed and counter flashed with insulated roof curbs with counter flashing strapped to the piping.

E. Counter flashing: galvanized steel, stainless steel or copper; clamp to the pipe.

2.4 HANGERS AND SUPPORTS:

A. Pipe hangers and accessories: Elcen, Fee & Mason, Grinnell, or Carpenter and Paterson, Inc.,
A. Hangers shall be the adjustable type.
B. Hangers for insulated lines shall be of sufficient size for pipe covering protection saddles and/or metal protecting bands to fit outside insulation.

B. Provide any special type of equipment supports required for supporting, guiding, or anchoring piping and equipment. Details of such supports shall be approved. Supports from bar joists shall be panel points, or joist shall have supplemental reinforcing as required.

C. Provide any intermediate supporting steel necessary for properly supporting, guiding, or anchoring the complete piping systems or equipment. Supplemental steel must be provided where required.

D. Supplemental steel: "Structural Grade" in accordance with the standard specifications of the American Society for Testing materials for "Steel for Buildings and Bridges", Serial Designation A36-1970T and factory primed.

E. Except where used for anchor purposes or supports for vertical pipes, and pipe clamp type, hanger shall be free fit on the pipe and spacers shall be used to prevent binding.

F. Beam clamps: Grinnell Fig #131.

G. Hangers for horizontal piping:
1. Cast Iron Piping: Grinnell Fig. 260

2. Copper Piping: Grinnell Fig. CT-99c (plastic coated)
3. Steel piping 2-1/2" and smaller (plumbing): Grinnell Fig. 104
4. Steel piping 3" and larger (plumbing): Grinnell Fig. 260

H. Inserts installed after concrete is poured or existing concrete: Rawl "Saber-Tooth," or Phillips "Red Head," self-drilling shells.

I. Insulation protection shields for pipes supported on clevis hangers: Grinnell Fig. 167.

PART 3 - EXECUTION

3.1 GENERAL:

A. Arrange piping for expansion and contraction. Install piping so as to preserve access to valves, air vents, and other equipment and to maintain the maximum headroom possible.

C. Arrange piping to avoid “bullhead” tees; converging flow streams are not to merge at 180^{O} from each other.

C. Connections to equipment: as shown in details on the drawings or as recommended by the manufacturer.

D. Install exposed piping so that when covering is applied it will not come in contact with adjacent surfaces. Group exposed pipelines together as neatly as possible.

E. Use reducing fittings in making reductions in pipe sizes.

F. Ream steel and copper piping after cutting.

G. Coat steel pipe and fittings buried underground, except as otherwise specified, with two coats of asphalt based paint.

H. Coat copper pipe and fittings installed in masonry walls or buried underground with asphalt base paint 1/16" thick.

I. Piping buried underground outside the building shall have not less than 24" depth of cover over the top of the pipe.

J. Use dielectric couplings for connecting steel and copper piping.

K. Grade water piping for drainage and to prevent air binding.

L. Unless otherwise indicated, conceal risers in walls, partitions, or in pipe chases, and conceal horizontal interior mains above ceilings except in mechanical equipment rooms.

M. For multi-story buildings provide isolation valves at the base of each water riser.

N. PVC piping shall not be installed in return air plenums.

3.2 SLEEVES:

A. Provide sleeves where pipes pass through walls, floors, and roofs.

B. Seal space between sleeve and pipe or insulation air and watertight. For pipes through slab on grade and foundation walls pack space between pipe and sleeve with alum and seal with sealant. Pack sleeves through floors and firewalls with fire resistant material to prevent fire spread.

C. Should it be necessary to drill holes through concrete slabs, such drilling shall be performed with core drills. The use of star drills will not be permitted.

D. Sleeves will not be required where cast iron soil stacks pass through floor slabs on grade.

3.3 FIRE STOPPING

A. Pack sleeves through floors and firewalls with fire resistant material to prevent fire spread. Fire retardant sealant shall be asbestos free, UL classified, and shall meet ASTM E814-1997. Forming and backing material installed with the sealant shall be bulk ceramic fiber or rigid fiberboard rated for 2300^0F. Manufacturers: 3M CP-25 Caulk/ 3M 2001 foam Fire Barrier, Hilti Firestop, Nelson Flameseal, Rectorseal Metacaulk, or Thompson & Betts Flame-Safe.

B. Plastic or insulated piping shall be fire stopped using an intumescent fire stopping system designed to expand under heat and seal the penetration. Hilti FS One, FS 657 Fireblock, CP642/643 collar, CP680 cat-in device; 3M # FS-195/RC-1.

C. All fire stopping materials shall be installed in strict accordance with the manufacturer's recommendations and the listing requirements.

3.4 PIPE HANGERS AND SUPPORTS:

A. Support:
   1. Horizontal runs of steel pipe: 8 ft. centers
   2. Horizontal runs of copper tubing: on not exceeding 6 foot centers for pipe size 3/4 inch and less, 8 foot centers for pipe sizes 1 inch and larger.
   3. Horizontal runs of cast iron soil pipe: on not exceeding 5 foot centers with hanger placed behind soil pipe hub or at joint.

B. A hanger shall be installed not over one foot from each change in direction of piping. Pipe hangers or supports shall be spaced not over 5 feet apart at valves.

C. Vertical piping shall be guided or supported in the center of each riser but not over 10 feet on centers and shall be supported at the base of the riser on a base elbow or tee with pipe stand. For un-insulated copper pipe or tubing, the riser clamp shall be copper or copper plated.

D. Provide pipe-covering protectors where hangers or supports are installed on exterior of pipe insulation.

E. Waterproofing shall not be pierced by support bolts.

F. Split ring and EZ-Grip hangers for Plumbing pipes shall be installed on interior of the pipe insulation. All other type hangers shall be sized and installed to bear on the outside of

insulation.

G. The body of all underground piping shall be firmly bedded on solid ground for its entire length.

H. Support piping on the roof by clamping to pre-manufactured polyethylene blocks with integral standard strut channel; Erico Pipe Pier.

I. Paint exposed steel piping with a black rust resistant paint, "Rust-Oleum" or equal.

3.5 FREEZE PROTECTION

A. Install water piping on the “occupied” side of building insulation systems, ie., on the inside of exterior wall insulation, and under “attic” insulation.

B. Water piping subject to freezing due to exposure and system operation shall be protected by wrapping with heat tape and covering with insulation. Heat tape shall be UL listed, self-regulating type, capable of maintaining a minimum water temperature of 40^{o}F at an ambient temperature of 0^{o}F. Heat tape shall operate on 120 Vac. Raychem XL-Trace or Chromalox RTSR.

C. Insulation shall be minimum 1" Fiberglass as specified in Section 15180.

3.6 SOIL, WASTE, and VENT PIPING:

A. Install horizontal drain and waste pipes with a minimum fall of 1/4th inch per foot unless otherwise indicated or directed by the Engineer/Architect. Where invert elevations of drainage lines are indicated on the Drawings, grade lines uniformly between invert elevations.

B. Make changes in pipe size on soil, waste, vent, and drain piping with reducing fittings or recessed reducers unless otherwise required by the applicable plumbing code. Bushings shall not be used.

C. Make changes in horizontal direction of soil, waste, vent, and drain pipes with long radius fittings, or with Y-branches and 1/8th or 1/16th bends, or a combination of both. Provide special fittings where required.

D. Where the building has a pitched roof, combine vents together in the attic. Route vents to the rear of the building; terminate in a location, which minimizes visibility from the ground. Paint exposed vent piping in a color to match the roof surface.

3.7 GAS PIPING:

A. Install drips consisting of 6" nipple and cap full size of connecting pipe at the base of all risers and where pipe is trapped.

B. Wrap underground piping with pipe wrapping tape, Johns-Manville "Trantex V-20" or equal, overlapped 50%.

C. Provide gas cocks at each piece of equipment. Install a gas cock on the house side of the meter.

D. Unless otherwise detailed on the plans, support exposed gas piping on the roof by strapping to premanufactured fiberglass pipe supports. Paint exposed gas piping with a black rust resistant paint, "Rust-Oleum" or equal.

E. Gas piping concealed above ceilings shall be welded construction. Where routed through an air plenum space, gas piping shall be encased in a vented conduit, or other method approved by local code officials.

END OF SECTION 15 060

SECTION 15 180 - INSULATION

PART 1 GENERAL

1.1 DESCRIPTION:

A. Provide insulation for equipment, piping and ductwork furnished under this division.

B. Piping not to be insulated:

1. Chromium plated brass connections to plumbing fixtures.

2. Underground domestic cold water piping.

1.2 QUALITY ASSURANCE:

A. Products of the manufacturers listed under PRODUCTS will be acceptable for use for the specific functions noted. Adhesives, sealers, vapor barriers and coatings shall be compatible with the materials to which they are applied, and shall not corrode, soften or otherwise attack such material in either the wet or dry state.

B. Material shall be applied subject to their temperature limits. Application of insulating materials or finishes shall be in accordance with manufacturer's published recommendations unless otherwise specified herein.

C. Insulation shall be applied by experienced workers regularly employed for this type of work.

1.3 RATING:

A. Insulation and accessories such as adhesives, mastics, cements, tape and jackets, unless specifically excepted, shall have a flame-spread rating of not more than 25 and a smoke developed rating of not more than 50. Materials, which are field applied, may be tested individually.

B. Flame Spread and Smoke Developed Ratings shall be determined by Method of Test of Surface Burning Characteristics of Building Materials, NFPA No. 255, ASTM E-84, UL 723.

C. Products or their shipping cartons shall bear a label indicating the flame and smoke rating do not exceed above requirements.

D. Treatment of jackets or facings to impart flame and smoke safety shall be permanent. Water-soluble, fugitive, or corrosive treatments shall not be used to meet RATINGS criteria.

E. Certify in writing prior to installation, that products to be used will meet RATING criteria.

F. The perm rating for vapor barriers shall be not more than 0.05 perms and the rating for adhesives, coatings and mastics shall be not more than 0.25 perms.

1.4 SHIELDS:

A. Pipe covering protection shields shall be provided around exterior of pipe insulation at pipe hangers, which fit around pipe insulation.

PART 2 PRODUCTS

2.1 FIBERGLASS PIPE INSULATION:

A. Insulate:
1. Domestic cold water, hot water and hot water circulating lines.
2. Above ground horizontal waste piping receiving waste from electric water coolers, from drinking fountain tailpiece outlet to connection at waste stack.
3. Condensate drain piping.

B. Insulation: one piece fibrous glass sectional pipe insulation with factory applied glass reinforced aluminum foil and white Kraft paper flame retardant vapor barrier jacket, with self-sealing longitudinal jacket laps and butt strips; average thermal conductivity not to exceed 0.23 BTU-in./ft.^{2} - ^{o}F. - hour at a mean temperature of 75^{o}F. Insulation thickness shall be 1".

C. Insulation:

Johns-Manville	Micro-Lok AP-T
Owens Corning	Fiberglass 25 ASJ/SSL

D. Insulating cement:

Johns-Manville	No. 301
48 Insulations	Quik-Set
Rockwood Mfg. Co.	Delta-Maid One Shot

E. Vapor barrier coating:

Benjamin Foster	Tite Fit 30-35
Vimasco	740
Insul-Coustic	F.R.V.B. IC-501
Childers Cil-Perm	CP-30

F. Breather coating:

Benjamin	Sealfas 30-36
Insul-Coustic	Permsure IC-102
Vimasco	713
Childers Chil-Seal	CP-50

G. Equal by Knauf.

2.2 PREMOLDED LAVATORY INSULATION:

A. Exposed waste and water piping under lavatories for use by handicapped persons: molded flexible vinyl insulation, finished in light gray. Fasten insulation with nylon fasteners.

B. Truebro Handi Lav-Guard or equal by Brocar Products, ProWrap by McGuire Mfr..

2.3 FIBERGLASS BLANKET INSULATION FOR DUCTWORK:

A. Systems: Supply and outside air ductwork.

B. Blanket type insulation:

1. "K" Value, average thermal conductivity, not to exceed 0.27 BTU-in./ft.^{2} - ^{o}F. - hour at a mean temperature of 75^{o}F
2. Minimum density of .75 lb/cu. ft.
3. 2" thick.

C. Insulation:

Johns-Manville	Microlite FSK faced wrap, 0.75 lb. density
Owens Corning	Fiberglass Faced Duct Wrap FRK 25, Series ED-100
Certainteed	Ultralite Duct Wrap Type IV

D. Fire retardant adhesive for securing insulation to ductwork and for sealing 2" facing flange at circumferential joints:

Benjamin Foster 85-20	Childers CP-82
Insul-Coustic IC-225	Eplux Cadalar 400
Vimasco 733	

D. Three inch wide foil reinforced kraft tape:

Arno C-430	Nashua FSK
Fason 0822	

2.4 FIBERGLASS LINER FOR DUCTWORK:

A. Systems:

1. Return air ducts.

2. Supply ductwork exposed in the space, or in mechanical room.

3. Supply ductwork for the first 10 ft. from the air handling unit, or through the second elbow, counting the one which turns the duct horizontally form the air handling unit.

B. Duct liner: fibrous glass type meeting ASTM C 1071, with one side coated with a fire retardant, anti-microbial compound.
1. "K" Value, average thermal conductivity not to exceed 0.27 BTU-in. per sq. ft. per degree F. per hour at a mean temperature of 75^{o}F,
2. Noise Reduction Coefficient: .70 or higher based on "Type A" mounting, tested per ASTM C 423.
2. Minimum density of 1-1/2 lb/cu. ft.
3. 1-1/2" thick.

C. Duct liner:

Johns-Manville	Permacote Linacoustic
Owens-Corning	Aeroflex Type 150
Certainteed	Ultralite # 150

D. Fire retardant adhesives:

Benjamin Foster 85-20	Childers CP-82
Insul-Coustic IC-225	Epolux Cadoprene 400
Vimasco 733	

2.5 FIBERGLASS INSULATION FOR INTERIOR STORM DRAINS:

A. For concealed interior storm drain piping, insulate the underside of roof drain bodies and all interior drain piping both horizontal and vertical including hubs and fittings with 1 inch thick rigid fiberglass with all service jacket, equal to Owens Corning type SSL II. Jacket shall be sealed to underside of roof all around roof drain bodies; lap and seal all joints.

B. Exposed interior storm drains and the underside of roof drains shall be insulated as specified for cold-water piping except insulation shall be 1 inch thick.

2.6 INSULATION FOR KITCHEN EXHAUST DUCT:

A. Insulate exhaust duct from the kitchen hood, and any hood surface, which is within 18" of any combustible material, including gypsum-building board.

B. Insulation shall be foil-encapsulated non-combustible inorganic flexible fireproofing wrap. Duct wrap shall have uniform thickness and density, Wrap shall be rated for zero clearance to combustible materials. Apply two layers of duct wrap to provide a 2-hour fire resistance enclosure for both vertical and horizontal duct runs. 3M Firemaster, Nelson Flameshield Blanket, JM Super Firetemp.

C. (Alternate) Thermal insulating wool shall conform to Federal Specification HH-I-558B, Form B, Flexible Type 1, Class 8, suitable for operating temperatures up to 1000^{o}F. Insulation shall be 1" thick Fiberglass TIW, Type 1 with 22 gauge galvanized steel cover.

PART 3 EXECUTION

3.1 GENERAL APPLICATION:

A. Complete piping and equipment tests required by other sections before insulation is applied.

B. Apply insulation and sundries as recommended by the manufacturer. Install insulation with smooth and even surfaces, without bulges, protrusions, raw edges, or wrinkles. The jackets shall be drawn tight and secured smoothly at longitudinal and end laps with adhesive.

C. Apply insulation on clean, dry surfaces. All insulation shall be continuous through wall and ceiling openings and sleeves, except duct insulation shall terminate at fire dampers and flexible connections. Apply insulation on cold surfaces, where vapor barrier jackets are used, with continuous unbroken vapor barrier sealed to prevent condensation.

D. Seal ends of fiberglass pipe insulation with white vapor barrier coating at valves, flanges and fittings and on straight runs of piping not to exceed 21 ft.

E. Do not insulate unions.

F. Do not use scrap pieces of insulation where a full-length section will fit.

G. Twist bonding wire terminals turned down into the insulation.

H. Staples will not be permitted in insulation nor on covering.

I. Construct insulation on equipment that must be opened periodically for inspection, cleaning or repair so that insulation can be removed and replaced without damage.

3.2 APPLICATION OF FIBERGLASS PIPE INSULATION:

A. Butt joints of pipe insulation together and secure jacket laps with lap adhesive. Seal butt joints with joint straps furnished with insulation.

B. Insulate fittings, couplings, hubs, strainers and valve bodies in plumbing pipe with premoulded fitting insulation or with flexible glass fiber with one piece fitting cover.

3.3 APPLICATION OF FIBERGLASS BLANKET DUCT INSULATION:

A. Wrap insulation around ducts with circumferential joints butted and longitudinal joints overlapped a minimum of 2 inches. Adhere insulation to ducts with 4" strips at 8" on center of fire retardant adhesive; additionally, for ducts over 24 inches wide, impale insulation on the bottom of the ducts on metal pins, on maximum 18 inch centers, welded to the duct and secure with speed washers. On circumferential joints, seal the 2" flange on the insulation facing with fire retardant adhesive and tape with 3" foil reinforced Kraft tape; tape terminations of insulation at fire dampers, flexible connections and ends of ducts to the duct with 3" wide foil reinforced Kraft tape. Seal penetrations and punctures in insulation facing with foil reinforced Kraft tape and fire retardant vapor barrier coating.

B. Mark insulation in such a manner to allow easy inspection after installation.

C. Apply insulation to standing seams and other projections in ductwork or casings so that at least 1/4" of insulation covers such projections.

D. Where ductwork is lined, no external ductwork insulation is required.

E. Where unlined duct and lined duct connect, the external insulation shall overlap lined section a minimum distance of 4 inches.

3.4 APPLICATION OF FIBERGLASS DUCT LINER:

A. Cut duct liner to provide overlapped and compressed longitudinal corner joints. Install liner with black-coated surface facing the air stream. Adhere duct liner to the ductwork interior with 100% coverage of the sheet metal surfaces using a fire retardant adhesive; adhesive shall be applied by spraying. Coat all exposed leading edges and all transverse joints with fire retardant adhesive. In addition, secure liner using metal pins welded to the duct and speed washers. Spacing of metal pin shall be in accordance with SMACNA Manual for "Duct Liner Applications Standard," Second Edition, 1975.

B. Protect exposed edges of the lining by 24 gauge galvanized "Z" shapes installed at the edge of the lining, extending over flat side of lining 1/2 from edge.

3.5 APPLICATION OF STORM DRAIN INSULATION:

A. The insulation on interior storm drain piping shall extend through hanger rings that are sized to fit around the insulation. Protective saddles shall be used. At protective saddles, install a section of wood, foam glass, or calcium silicate same size as saddle. Jacket shall extend over this material.

3.6 APPLICATION OF KITCHEN EXHAUST INSULATION:

A. Install kitchen hood exhaust duct insulation on exhaust duct in strict accordance with the manufacturer's published instructions.

B. (Alternate) Install insulation with welded pins or mechanical fasteners. Cover surface with minimum 22 gauge galvanized steel installed in accordance with NFPA 96.

3.7 WEATHERPROOFING:

A. Protect insulation exposed to weather outside the building with .010" thick corrugated aluminum covers. Locate longitudinal joints to shed water and secure with 3 aluminum bands per section. Cover fittings with a layer of glass fabric embedded between two 1/16" coats of breathing mastic, overlapping adjacent aluminum a minimum of 2".

B. Insulation covers shall be used on all exterior insulation, including refrigerant piping.

END OF SECTION 15 180

SECTION 15 400 - PLUMBING

PART 1 GENERAL

1.1 DESCRIPTION:

A. Include all necessary apparatus, excavating, controls, valves, and fittings required for a complete sanitary plumbing system.

1.2 UTILITIES AND SERVICES:

A. Sanitary: Provide sanitary drainage, connect to sewer. Make arrangements for and pay all fees in connection with this installation.

B. Water: Provide domestic (City) water, connecting to water mains. Arrange for tap to main and installation of meter. Pay any fees associated with new water service.

C. Natural Gas: Provide natural gas service, connecting to gas mains. Arrange with local gas company for installation of gas service including meter and shall pay all costs associated with new or revised gas service.

1.3 TESTS:

A. Test the plumbing system as required by the applicable plumbing code.

B. Test water piping for a continuous period of not less than four hours at a hydrostatic pressure of not less than one hundred twenty-five (125) pounds and make free from leaks. Completely remake leaky joints with piping dry. Retest system after leaks are corrected.

C. Plug all necessary openings in the drainage and vent-piping systems fill the entire system with water to the level of the highest vent stack above the roof. The system shall hold this water for 30 minutes without showing a drop in water level greater than 4 inches. Subject to approval of the Architect the drainage system may be tested in sections.

D. Test natural gas piping at 50-psig minimum using compressed air or inert gas for a minimum of 6 hours without a discernable loss of pressure when adjusted for temperature changes. Subject all joints to a soapsuds test during testing.

1.4 STERILIZATION:

A. Disinfect the potable water system in accordance with the Plumbing Code. After disinfection, send water samples to the Local Health Department for testing. Obtain approval of the Local Health Department before the system is placed into service.

B. Unless the Local Health Department requires otherwise, disinfect potable water piping upon completion of installation by a mixture containing not less than 0.6 pound of high-test calcium hypochlorite, or 2 pounds of chlorinated lime to each 1000 gallons of water to provide not less than 50 ppm of available chlorine. Inject the mixture into the system and retain for not less than 24 hours, at which time the chlorine level shall be at 10 ppm or greater. Then drain the system and flush with potable water until only a normal chlorine residual remains (.2 ppm).

PART 2 MATERIALS

2.1 PLUMBING FIXTURES:

A. Provide plumbing fixtures complete with trim. All fixtures, trimmings and stops shall be Grade "A" and shall be of one manufacturer. Plumbing fixtures and trim shall be as scheduled on the plans.

B. Plumbing fixtures for use by handicapped persons shall be in accordance with the Americans with Disabilities Act(ADA).

C. Plumbing fixtures shall be low water consumption type: 1.5 gal/flush for water closets, and 1.0 ga;./flush for urinals unless specified otherwise.

D. Manufacturer's:
1. Fixtures: American Standard, Eljer or Kohler.
2. Trim: American Standard, Chicago Faucet, Symmons, Speakman, T&S Brass.
3. Flush valves:Sloan Regal, Delaney, Zurn
4. Seats: Bemis, Beneke, Church or Olsenite.
5. Drinking Fountains: Elkay, Halsey Taylor, or Oasis.
6. Stainless Steel Sinks: Just, Elkay
7. Fiberglass & Acrylic Shower Enclosures: Aquaglass

2.2 WATER HEATERS:

A. Water heaters shall be fully automatic, gas water heater, AGA listed, complete with: insulation in accordance with ASHRAE 90A-80, magnesium anode, glass lined tank, coated steel jacket, adjustable thermostat, gas burner, gas regulator, pilot light, overheat control, all operating controls. Water heater shall have separated combustion and venting, and shall vent through PVC piping.

B. Water heaters shall be guaranteed by the manufacturer for a period not less than 3 years after start-up. Contractor shall furnish to the Owner manufacturer's guarantee.

C. Water heater shall have a combination temperature and pressure relief valve having the capacity to relieve the full capacity of the heating element on both temperature and pressure relief. Valve shall be Watts and shall be ASME rated.

D. Water heaters shall be Lochinvar, A.O. Smith, or State.

2.3 FLOOR DRAINS:

A. Josam Manufacturing Company; Zurn Industries, Inc., Wade Manufacturing Company, Smith. All drains shall be of the same manufacturer

B. Floor Drain (FD) - Josam Series 30000-A coated cast iron floor drain, two piece body with double drainage flange, flashing collar, weep holes, bottom outlet, inside caulk connection, adjustable satin nikaloy strainer and cast iron p-trap. Strainer top shall be two sizes larger than drain size.

C. Floor drains shall be provided with a trap primer valve and line, Josam 88250, connected to the nearest cold water line serving a plumbing fixture. Connect trap primer to water service before banks of fixtures. Trap primers shall be located above accessible ceilings, or behind

access panels. Trap primers exposed on the wall of the space will not be acceptable.

2.4 ROOF DRAINS:

A. Josam Manufacturing Company; Zurn Industries, Inc., Wade Manufacturing Company, Smith. All drains shall be of the same manufacturer.

B. Roof drains (RD): Josam Series 21000 arranged for inside caulking with outlets the same size as the downspouts to which they are connected and shall have deck clamps.

2.5 CLEANOUTS:

A. Cleanouts in cast iron soil pipe lines shall consist of cast iron ferrule and heavy brass cleanout plug with square head. Where piping is concealed in floors or walls, install cleanouts with counter-sunk plugs and covers in and near surface of floors or walls.

B. Cleanouts for floors shall be Josam Manufacturing Company's Series 58000 with inside caulk outlet coated cast iron internal cleanout with lead seal, brass rim and Nikaloy cover plate for light traffic secured to plug by countersunk screw for installation flush with finished floor. For floors with VCT, provide cover plate with depression for inset of VCT. Provide carpet marker in carpeted areas. Cleanouts in walls, Josam Manufacturing Company's Series 58710 with stainless steel covers.

C. Equal manufactured by Zurn Industries, Inc., Wade Manufacturing Company, or J.R. Smith.

2.6 WATER HAMMER ARRESTORS:

A. Water hammer arrestors shall be selected and sized in strict accordance with Standard P.D.I. - WH201.

B. Arrestors shall be Josam 75000 or equal Zurn, Smith, Wade, Precision Plumbing Products.

2.6 DOMESTIC WATER SERVICE/WATER PRESSURE REDUCING VALVE:

A. Where pressure of water service exceeds 70 PSI, a water pressure-reducing valve shall be provided. Water pressure reducing valve for building shall be high capacity regulator Watts Series 223-S rated 250 PSI inlet, set 65 PSI outlet. For sizes larger than 2-1/2", use multiple PRVs in parallel.

B. When a PRV is not required, incoming water service shall incorporate a strainer with a pressure gauge on each side. Watts 77 Series strainer.

2.7 HOSE BIBBS:

A. Interior hose bibs (non-freeze areas): Woodford Model 24P-1/2, 1/2" chrome plated, all brass construction with adjustable packing nut, Teflon impregnated packing and standard "O" size washer, tee handle, and vacuum breaker.
Equal by Chicago Mfg. or T & S Brass Co.

B. Exterior hose bibbs (freeze proof wall box): Woodford Model B65, and shall be non-freeze, automatic draining type with vacuum breaker, all brass construction enclosed in flush mounted, chrome plated, brass wall box.
Equal by Chicago Mfg. or T & S Brass Co.

2.8 BACKFLOW PREVENTER:

A. Watts #909 water pressure backflow preventer of same size as pipe installed in. Complete with check valve, gate valves, and test cocks. Equal by Cla-Val or Cash Acme.

2.9 VACUUM BREAKERS AND CHECK VALVES:

A. Provide on connections to all hose bibbs, hose outlets, wall hydrants, below the rim water supplies of all types, plugged or capped outlets, and at all locations specified or shown. Vacuum breakers shall be Watts Regulator Company Model No. 288A or Sloan Valve Company Series V with bronze body chrome-plated in finished areas.

2.10 EXTERIOR GREASE INTERCEPTOR:

A. Provide an exterior grease interceptor. Grease interceptor tank shall be shall be precast, or poured in place 3,000 psi, 28 day reinforced concrete, 1,500 gallon minimum capacity. The tank shall be type approved by the local plumbing code for use as a grease interceptor. Submit proposed tank and layout, along with all supporting data, for review.

B. Manhole accesses shall be cast into the tank cover slabs, one at each end of the tank. The top of the cleanout shall be set to the grade shown on the drawings and cast into an 18"X18"X6" concrete coaming. The tank shall have baffles installed. All inlet and outlet pipes shall be built into the form work and cast into place at the time of the pouring or constructing of the structure.

C. Epoxy protective coating: Coppers Type 300M coal tar epoxy, or equal.

PART 3 EXECUTION

3.1 GENERAL

A. Make connections to all fixtures, traps and similar items. Place into operation all equipment.

B. Refer to architectural drawings for the exact location of fixtures and drains. Determine roughing dimensions from the manufacturer of the equipment furnished on the job.

3.2 PLUMBING FIXTURES:

A. Grout between plumbing fixtures and walls and/or floors.

B. For connection of floor-outlet water closets, brass floor flanges shall be used. The joints between closet trap and flange shall be made tight with gaskets.

C. Connection of fixture traps from lavatories, drinking fountains, service sinks, etc. to cast iron shall be made with D.W.V. type copper.

D. Seal, using sealant-meeting requirements of Federal Specification TT-S-230, joint between urinals and wall and at water closet and floor.

3.3 FLOOR DRAINS:

A. Set floor drains with top flush with finished floor. Route water line from trap primer connection to floor drain concealed inside walls, partitions, and the floor system.

3.4 ROOF DRAINS:

A. Install roof drains with lead flashing extending at least 8" from the clamping ring in all directions.

B. In special roofing systems, flash in accordance with roofing manufacturers recommendations.

3.5 WATER HEATERS:

A. Provide drain pan under water heater. Pipe relief valve discharge to drain pan. Pipe drain pan drain to floor drain, or to the nearest utility or janitor's sink. Do not make direct connection to drain.

B. Provide expansion tank at water heater.

C. Route PVC vent and combustion air piping to exterior, terminate in factory supplied cap. Install venting and combustion piping as required by the manufacturer.

3.6 CLEANOUTS:

A. Provide cleanouts where required by the applicable plumbing code.

B. Cleanouts shall be the same size as pipe line in line sizes 4 inches and smaller. Pipelines larger than 4 inches shall have 4 inch cleanouts.

C. Cleanouts installed outside buildings shall be same as in floors and shall be flush with grade and have minimum 6 inch thick, 12 inch by 12-inch concrete pad poured around Cover. Cover shall be flush with top of concrete.

3.7 PRESSURE REDUCING VALVES:

A. Provide for a pressure test of the water service. Where pressure exceeds 70 PSI, provide a pressure reducing station. Pressure reducing station shall include a pressure reducing valve, by-pass with globe valve, pressure gauges and isolation valves at entering and leaving sides.

3.8 BACKFLOW PREVENTER:

A. Provide in incoming domestic water service where required by local codes or utility requirements.

B. Provide a full size copper drain line from unit to floor drain.

3.9 EXTERIOR GREASE INTERCEPTOR:

A. Excavation and backfill shall be in accordance with other divisions of the specifications.

B. Caulk tank slabs at all joints, to form a leak proof seal. Prior to applying coal tar epoxy, test tank for water tightness by filling with water to the outlet elevation for a period of at least 24 hours. Any leaks detected will be repaired and the test repeated until no leakage is observed by drop in water level. Apply two coats of coal tar epoxy to the interior of the tank in accordance with coating manufacturer's instructions. Backfilling shall not begin until no leakage is present.

END OF SECTION 15 400

SECTION 15 500 - FIRE PROTECTION

PART 1 GENERAL

1.1 DESCRIPTION

A. Provide a complete, hydraulically calculated, sprinkler system including connection to water main on the site, riser, alarm valve with trim, piping, heads, fire department connection, water alarm gong, compressor, and electric flow switch for connection to fire alarm system.

B. Any portion of the system serving, or routed through, unheated space shall be "dry" type, charged with compressed air.

C. Where required by local utility, provide backflow preventer in supply service to fire protection system. Backflow preventer assembly shall be outside the building prior to any other valves or take-offs. Double Check valve assemblies shall be the same size as the incoming water service. Double check valve assemblies shall include a shut-off valve immediately upstream and downstream of the double check valve. Shut-off valves may be supplied as part of the check valve package. Backflow preventer to be located on site in a ground box.

1.2 QUALIFICATIONS

A. The fire protection work shall be accomplished by workmen experienced in the installation of fire protection sprinkler systems. The organization selected to install the systems shall have a minimum of five (5) years continuous practice in the exclusive business of design and installation of sprinkler systems. Submit qualifications prior to submittal of shop drawings.

1.3 BASIS OF DESIGN

A. Hazard Classification: Light Hazard.

B. Arrange to have a flow test performed and include test results in shop drawing submittal. Flow test shall indicate static and residual pressures, flow, and location of test including elevation relative to finished floor elevation.

1.4 SHOP DRAWINGS

A. Prepare shop drawings including hydraulic calculations for the sprinkler system in accordance with NFPA-13. Protect all spaces of the building, including concealed ceiling and truss spaces.

B. Connect the system to the fire alarm system if one is present.

C. The drawings issued with these specifications are for bid purposes only and are generally diagrammatic, not showing hangers, offsets, etc. required. Coordinate the design of the system closely with the HVAC, Plumbing and Electrical systems to avoid interference with other systems. Review drawings to ensure that the fire protection system will be concealed above ceilings.

E. Shop drawings and calculations shall show details of the sprinkler system installation as they pertain to the specific building, NFPA-13, and the local governing authority. Submit copies of shop drawings and calculations to the local governing authorities for review before

submitting to the Architect. Submit six (6) copies of shop drawings to Architect for review. One copy of the shop drawing shall have stamp and comments from the local governing authority.

1.5 INSPECTION AND TESTS:

A. Conduct approval tests as listed in NFPA-13. Submit reports of tests to the Architect. The Architect or his representative may inspect the equipment, piping, etc.,at any time during installation.

PART 2 MATERIALS

2.1 MATERIALS AND INSTALLATION

A. Use only materials, sprinkler devices, pipe, fittings, valves, hangers, etc. which are new and on the approved or acceptable list of the current issue of inspected fire protection equipment and materials as published by the FIA, FM or U.L.

B. Install system in accordance with NFPA-13 and NFPA-24.

2.2 SPRINKLER HEADS

A. Rating: 165^0F.

B. Sprinklers in suspended ceilings:
- Semi-recessed, pendant type
- chrome plated finish, and matching escutcheon.
Locate heads in center of tile or on quarter points in the long direction of tiles.

C. Sprinklers in areas without ceilings:
- Standard upright type
- chrome plated finish.

D. Sidewall type sprinklers
- standard horizontal sidewall type
- chrome plated finish with matching escutcheon.

2.3 EXTRA SPRINKLERS AND CABINETS

A. Provide an approved cabinet containing not less than twelve (12) extra sprinkler heads including at least three of each type of head, and one (1) sprinkler wrench near the sprinkler riser.

2.4 PIPE AND FITTINGS

A. Above ground piping inside of buildings shall conform to the requirements of NFPA No. 13. Piping shall be metal; no plastic piping is acceptable. Indicate on the shop drawings the type of pipe and jointing selected for use, and submit catalog cuts or letters from manufacturers of all pipe and fittings, certifying compliance with the standards defined in NFPA 13.

2.5 VALVES

A. Gate valves: OS&Y flanged iron body, bronze mounted, Underwriters approved for 175 psig WWP, Kennedy fig. 68.

B. Check valves: flanged iron body swing or wafer type, bronze mounted with bronze face disk, Underwriters approved for 175 psig WWP, Kennedy Fig. 126 or Fig. 706.

C. Jenkins, Kennedy, Crane, Stockham or Walworth.

2.6 INSPECTOR'S TEST CONNECTIONS:

A. Provide test connections. Inspector's test connections shall pass through the building walls approximately one foot above the building floor or outside grade or shall extend to floor drain.

2.7 FIRE DEPARTMENT CONNECTION:

A. Provide a wall Siamese connection to the riser complete wtih check valve, ball drip, wall plate, etc. as required by NFPA-13. Siamese shall have clapper and plugs and chains. Threads shall conform to local fire department standards.

2.8 SPRINKLER PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with electrically or hydraulically operated alarms, with pressure retard chamber and variable pressure trim. The flow switch for each alarm valve shall have double pole, single throw contact, which shall be normally open. The contact shall be rated for 125-volt operation.

B. Water Motor Alarm: Hydraulically operated impeller type alarm gong, red enameled.

C. Water Flow Switch: Vane type switch with two contacts.

2.9 SIGNS:

A. Provide and place suitable signs indicating the purpose of each control valve, test connection, main and auxiliary drains, etc., as required. Nameplates as required for hydraulically designed systems by NFPA-13 shall be installed.

2.10 CUTTING, PATCHING, CARPENTRY AND MASONRY WORK:

A. Do all cutting, patching, carpentry, and masonry work required for the installation, conforming to the surrounding surfaces in every respect, including painting, tiling, etc. No cutting or patching shall be performed without first obtaining approval of the Architect and cutting patching of new concrete or masonry will not be permitted unless absolutely necessary.

2.11 PIPE HANGERS, SLEEVES, WALL AND CEILING PLATES:

A. Support piping in accordance with the Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS) Standard Practice SP-58, SP-69, latest edition, and NFPA requirements.

B. Hangers and supports shall be capable of vertical adjustment under load. All rods shall have

double locknuts. Hangers and supports shall be carbon steel, malleable iron, or cast iron; copper plated or insulated with rubber, neoprene, or sheet lead gaskets for copper pipe and tubing. hangers and supports of chain, strap, gray cast iron, or wire will not accepted.

C. Hanger rings:
- Pipe 3 inch and smaller: adjustable, Grinnell Figure No. 101.0
- Pipe 3-1/2 inch and larger: adjustable, Grinnell Company's Figure No. 101 or 260.

D. Beam clamps for supporting branch lines:
- Piping 4 inch and smaller: Grinnell No. 83, 86, 94, or 227.
- Piping 5 inch to 8 inch: Grinnell Figure No. 225, 226 or 270
Use beam clamps where piping is supported from building structure.

E. Do not punch or drill structure, except for support of piping. Provide supplementary steel for intermediate hangers as required.

F. Indicate on working drawings the type and location of hangers proposed for use for the support of branch lines and mains under the different types of roof and ceiling construction.

G. Provide wall and ceiling plates with setscrews whenever pipes pass through walls or ceilings.

H. Sleeves shall be as specified in Section 15060, PIPING.

PART 3 EXECUTION

3.1 REQUIREMENTS

A. Install in accordance with NFPA-13 and NFPA-24.

B. Install gate valve inside building at main entrance ahead of alarm valve.

C. Pitch all pipe for drainage and provide drain valves at low points.

D. Thoroughly flush new water connections before connecting to the sprinkler system riser. Provide necessary pipe, hose, etc., to discharge the water so that it will not damage buildings or surrounding property.

E. Interface sprinkler system with building fire and smoke alarm system.

F. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent Siamese connectors to allow full swing of fire department wrench handle.

3.2 TESTS

A. Perform tests as required by standards listed and prepare report of tests as required by standards.

3.3 WATER MOTOR GONGS:

A. Provide a water operated gong with protective hood at each alarm valve. Connections to the alarm valves, drain connections, and all accessories shall be as required. Gongs shall be tested and left in fully operative condition. Drains from the alarm gongs shall be

connected into the alarm valve drain with a check valve.

3.4 ALARM VALVES:

A. Provide a variable pressure alarm valve in each of the sprinkler system supply risers, each equipped with retarding chamber, flow switch for electric alarm connections, gauges, test and drain connections and required standard accessories.

B. Mount the alarm valves as close to the wall as possible and accessories shall be mounted along the wall and not extended out into the room. Drains from alarm valves shall pass through building wall approximately one (1) foot above the floor or outside grade or shall extend to floor drain.

END OF SECTION 15 500

SECTION 15 650 - HEATING, VENTILATION, AND AIR CONDITIONING

PART 1 GENERAL

1.01 AIR HANDLING EQUIPMENT REQUIREMENTS:

A. Fans:
   1. Capable of delivering air quantity at static pressures noted on drawings within the limits of the motor provided without use of the motor's service factor. Note that external static pressure is defined as the static pressure external to the equipment referenced with clean filters in place and a wet cooling coil if applicable.
   2. Tested and rated in accordance with the Air Moving and Conditioning Association, Inc., Standard No. 210-74, Test code for Air Moving Devices.

B. V-Belt drives:
   1. Designed for not less than 150% of connected driving capacity.
   2. Motor sheaves adjustable to provide not less than 20% speed variation.
   3. Select sheaves to drive the fan at a speed to produce the scheduled capacity indicated on the drawings when set at the approximate midpoint of the sheave adjustment.
   4. Provide adjustable bases for motors with V-Belt drives.
   5. Provide guards for belt drives exposed without removing access panels, ductwork, or housings.
   6. Guards: designed with adequate provision for movement of the motor required to adjust belt tension. Provide means to permit oiling, use of speed counters and other maintenance and testing operations with the guard in place.

C. Fan motor enclosures: open drip proof type unless specifically indicated otherwise.

D. Roof Fans: waterproof design so that water cannot enter the building through the fan housing, whether or not the fan is operating.

E. Centrifugal fan wheels: statically and dynamically balanced.

F. Safety disconnect switches: conform to the requirements of Division 16 - ELECTRICAL.

1.02 AIR CONDITIONING EQUIPMENT REQUIREMENTS:

A. Air conditioning equipment: rated in accordance with American Refrigeration Institute Standards. Electrical equipment: U.L. listed.

B. Cooling capacities: not less than that scheduled on drawings

1.03 GAS FIRED HEATING EQUIPMENT REQUIREMENTS:

A. Gas fired heating equipment: certified by the American Gas Association under ANSI Z83.9a-1980.

B. Gas fired equipment shall be vented, and shall have provisions for combustion and ventilation air, as required by the code referenced in Section 15010, MECHANICAL GENERAL REQUIREMENTS.

PART 2 - PRODUCTS

2.01 CEILING AND INLINE CENTRIFUGAL EXHAUST FANS:

A. Fans:
1. Steel cabinets with fiberglass interior lining
2. Provided with backdraft damper and disconnect switch
3. Resiliently mounted centrifugal wheels with direct drive motor.
4. Acme, Carnes, Cook, Greenheck, Jenn-Aire, ILG or Penn.

B. Ceiling exhaust fans: grille on fan intake.

C. Provide roof caps for roof discharge and brick vents for wall discharge.

2.02 ROOF EXHAUST FANS:

A. Roof exhaust fans:
1. Centrifugal
2. Aluminum housing
3. Separate weather-proof motor compartment
4. Disconnect switch
5. Backdraft damper
6. Birdscreen
7. Insulated prefabricated curb.
8. Acme, Carnes, Cook, Greenheck, Jenn-Aire, ILG or Penn.

2.03 UPBLAST EXHAUSTERS:

A. Fan shall be of aluminum construction complete with motor, drive, bird screen, backdraft damper, disconnect switch, and curb. Fan shall have drain fitting and shall have a vertical throw of at least 30' at a terminal velocity of 100 FPM.

B. Fans used for kitchen hood exhaust shall have an external grease trough, and a discharge height of 40" above roof. Curb shall be of heavy gauge steel construction and shall be hinged to allow cleaning of impeller and duct,

C. Fans shall be Acme, Carnes, Cook, Greenheck, Jenn-Aire, ILG or Penn.

2.04 MAKEUP AIR UNIT:

A. Makeup air unit shall be indirect fired type with gravity vented natural gas furnace, arranged for roof mounting, with downturn discharge plenum, O.A. intake hood with bird screen, and roof curb. Unit shall be designed for outdoor installation.

B. Blower shall be centrifugal type with open drip proof motor and adjustable belt drive.

C. Unit shall be equipped with intake damper with two position motor, filter rack with throwaway filters, freezestat, intermittant spark pilot, discharge thermostat, 2 stage gas valve, and control console with heating override thermostat. Heat-off-vent switch and exhaust fan relay contacts. Unit shall be Greenheck, Reznor, Hastings, Modine.

2.05 CENTRAL STATION AIR HANDLING UNITS:

A. Central station air handling units: draw through arrangement, complete with

1. Mixing box with outside air and return air dampers
2. Filter section
3. Coil section
4. Coils
5. Fan Section
6. Fan
7. Modifications for VVT (Variable Volume/Temperature) operation

B. Unit casing:
   B. Heavy gauge galvanized steel formed panels removable for access
   C. Minimum 1-1/2 pound density fiberglass insulation inside with waterproof adhesive and permanent fasteners meeting NFPA-90A flame spread and smoke generation requirements
   D. Discharge collar extending 1" beyond casing to facilitate duct connection.
   E. Condensate drain pan:
      a. Double wall construction with threaded drain connections.
      b. Extend under coil section and fan section.

C. Coil sections:
   1. Casings: galvanized steel and steel headers.
   2. Coil tracks to provide slip-in, slip-out coils.
   3. If coils are stacked, provide intermediate drain pans for condensate, piped to the main pan.
   4. Coils:
      a. ARI certified.
      b. Arranged for counter flow of air and water.
      c. Sized for a design velocity of 500 FPM
      d. Aluminum or copper fins on copper tubes.
      e. Maximum fin spacing: 14 fins per inch.
      f. Designed for 300 psi at 200^{o}F
      g. Tested with air under water for 3560 psi.

D. Fan:
   1. Double width double inlet (forward curved) (backwardly inclined airfoil) blades
   2. Statically and dynamically balanced.
   3. Belt drive with guard; adjustable, sized to transmit 150% of motor horsepower.
   4. Comply with ARI Standard 430.
   5. Bearings:
      a. Pillow block grease lubricated ball bearing with extended grease fitting.
      b. Average life: 200,000 hours.
   6. Motor:
      a. Mounted on adjustable base
      b. Open drip proof
      c. Horsepower: sufficient to operate unit at specified maximum and minimum condition of operation

E. Low velocity filter section: access doors, racks and extended life filters with a minimum efficiency of 30% ASHRAE, 2 inches thick. Provide magnehelic filter gauge mounted on casing.

F. Mixing boxes:
   1. Parallel or opposed blade outside air and return air dampers.
   2. Dampers:

a. Secured to steel shafts
b. Nylon bushings.
c. Mounted in galvanized steel frames.
d. No more than 1% leakage at the rated static pressure of the fan to which they are connected.

G. Carrier, Trane, Lennox, McQuay.

2.06 SPLIT SYSTEM CONDENSING UNIT:

A. Split system condensing unit:
1. Factory matched to air handling unit direct expansion cooling coil
2. Same manufacture as air handling unit
3. Minimum SEER of 10.0 when rated in accordance with ARI Standard 210.
4. Air cooled complete with refrigerant and oil charge.
5. Brass service valves with fittings and gauge ports.
6. Modifications for VVT (Variable Volume/Temperature) operation

B. Compressor:
1. Scroll type hermetic type with internal vibration isolation.
2. 5 year warranty.

C. Condenser coil: aluminum plate fins mechanically bonded to non-ferrous tubing.

D. Condenser fans: propeller type direct drive arranged for vertical air discharge. Fan motor shall be factory lubricated with inherent protection.

E. Controls:
1. Factory wired
2. Thermal and current overload devices for the compressor
3. Crankcase heater
4. High and low pressure safety switches
5. Filter-dryer
6. Liquid line sight glass.

F. Accessories:
1. Timed off control
2. Low ambient kit for operation to $O^{o}F$.

G. Carrier, Trane, Lennox, McQuay.

2.07 VVT DAMPERS:

A. Zone Dampers shall include:
1. A motorized damper assembly constructed of 24 gage galvanized iron with blade of 20 gage.
2. Blade operation providing full modulation from open to closed position.
3. Round dampers shall have elliptical blades with a seal around the entire damper blade edge. Rectangular dampers shall have fully sealed edges.
4. A duct temperature sensor shall be an integral part of the damper assembly.

B. Refer to Section 15900, Automatic Controls

C. Trane, Carrier, Lennox, McQuay

PART 3 - EXECUTION

3.01 GENERAL

A. Install equipment in accordance with manufacturers recommendations.

B. Operate equipment after installation and prior to occupancy of building. Correct deficiencies in operation prior to building occupancy.

C. Remove all shipping materials and hold down bolts.

D. Install equipment on roof watertight and provide flashing or counterflashing as required.

E. Do not operate air handling equipment without filters in place. Install clean set of filters after construction is complete and building is cleaned.

F. Arrange equipment for maximum accessibility to portions requiring service and/or maintenance.

3.02 FANS

A. Secure roof mounted fans with corrosion resistant screws on all sides at a maximum of 36" O.C.

B. Support ceiling and Inline exhaust fans as specified for sheetmetal with straps at each corner of fan and with a minimum of two screws securing fan to strap. Provide vibration isolation hangers and support rods where indicated on drawings.

3.03 VVT DEVICES

A. Mount to provide access to controls and operators.

B. Route inlet duct straight for a minimum of 3 duct diameters ahead of the VVT damper. Where the damper size is smaller than the inlet duct, reduce at the damper.

END OF SECTION 15 650

- SECTION 15 800 - DUCTWORK AND AIR DISTRIBUTION

PART 1 GENERAL

1.1 DUCTWORK:

A. SMACNA Standards referred to hereinafter shall mean standards published by the Sheet Metal and Air Conditioning Contractor's National Association, Inc.

B. Except where indicated otherwise, duct construction and installation shall conform to the recommendations of the following:
1. SMACNA manual for Low Pressure Duct Construction Standards, 5th Edition, 1976.
2. SMACNA manual for High Pressure Duct Construction Standards, 3rd Edition, 1975.

Ductwork between the air handling unit and variable volume devices shall be constructed and sealed as required for a 6" static pressure rating, Seal Class "A. Other ductwork shall be constructed and sealed as required for a 2" static pressure rating, Seal Class "B".

C. Ductwork as indicated is diagrammatic only and does not show all necessary offsets, hangers, and accessories. The Contractor shall furnish all such items required for a completed system.

D. Sizes shown for lined ductwork are clear inside dimensions and sheet metal dimensions shall be increased to allow for thickness of lining.

1.2 AIR DISTRIBUTION:

A. Select products to provide full coverage of areas served without objectionable noise or draft. Products shall be selected for noise levels not in excess of NC-35. Air distribution products shall be tested and rated in an Air Diffusion Council Certified Laboratory. Unless indicated otherwise, all air distribution products shall be furnished by one manufacturer, who shall catalog a full line of both steel and aluminum air distribution devices.

PART 2 PRODUCTS

2.1 DUCTWORK:

A. Ductwork: constructed of galvanized steel sheets.
Exposed sheet metal: "paint grip" type galvanized steel.
Angles, rivets, nuts and bolts: of the same material as the duct in which installed.

B. Longitudinal seams at corners of rectangular ducts: Pittsburgh type or button punch snap lock with locks preferably on the tops and bottoms of ducts, not on the sides.

C. Cross-break duct panels for rectangular ducts over eighteen (18) inches in either height or width, except:
1. Where grilles, diffusers or access doors are to be installed, unless the distance from the edge of the grille, diffuser or access door to the edge of the panel exceeds eighteen (18) inches. The area to which the grille, diffuser or access door is attached shall be left flat.
2. Ducts, which are finished with rigid insulation.

D. Elbows: square type with turning vanes. Where elbows have a different size inlet and outlet, turning vanes shall be single thickness type with extensions on the leaving side. Turning vanes shall be installed with vanes parallel to the elbow.
E. Tee connections on branch ducts shall be the radius tap-in type. Branch take-offs from trunk ducts shall be similar to SMACNA Plate 2-5, except that adjustable splitter damper shall be provided at these points or SMACNA Plate 26, Fig. B with adjustable vanes.

2.2 HANGERS & SUPPORTS

A. Hangers and supports for ductwork: in accordance with SMACNA standards.

2.3 KITCHEN EXHAUST DUCT:

A. Exhaust ductwork shall meet requirements of NFPA-96 and shall be 18-gauge type 304 stainless steel with welded joints or welded joint 16 gauge galvanized steel. Removable bolted cleanout panels shall be provided.

2.4 FLEXIBLE CONNECTIONS:

A. In rectangular ducts:
   1. Weatherproof minimum 20 oz.
   2. Not less than six (6) inches long, with suitable metal collar frame at each end with allowance of at least two (2) inch slack in fabric to eliminate vibration transmission.
   3. Ventglas as manufactured by Vent Fabrics, Inc., Eigin Mfg., or Duro Dyne Corp

B. Flexible connections exposed to the weather: watertight, constructed of at least two layers of fabric.

C. Provide flexible connections to ductwork at the air handling units and fan-coil units.

2.5 DUCT CLOSURE COLLARS:

A. Provide:
   1. Where ducts pass through masonry walls and partitions, which extend full height to the underside of the structure
   2. On both sides of walls and partitions, except where registers and grilles are installed

B. Fabricate from 22 gauge galvanized steel sheet.

C. Install flanges tight against the wall. Pack the space between the duct and the wall with fiberglass blanket insulation.

2.6 DUCT AND PLENUM ACCESS DOORS

A. DOORS:
   1. Double wall construction of not less than 24 gauge galvanized steel sheet, with 1" thick neoprene coated fiberglass insulation between the walls.
   2. A continuous hinge on one side and cam latch with striker plate on the other side
   3. Height over 12 inches: not less than 2 cam latches with striker plates.

B. DOOR FRAME:
   1. Not less than 22 gauge galvanized steel

2. Knock-over edges for securing to duct.

C. DOOR ASSEMBLY
1. Double gasketed to provide seals from the door to the frame and from the frame to duct.

D. SIZE:
1. To allow proper access to intended device
2. Minimum 12" x 16", except as indicated on the drawings.

2.7 FLEXIBLE DUCT:

A. Insulated, with a flame spread rating not over 25 and a developed smoke rating not over 50.

B. Not less than 1" thick fiberglass with a vapor barrier jacket.

C. Inner sleeves: fiberglass or tedlar covered spring steel.

D. Rated for 6.0-inch static pressure.

E. Connected with circumferential compression clamps consisting of either screw-driven, slotted stainless steel bands or ratcheted nylon straps.

F. Clevaflex, Genflex, Flexmaster, Thermaflex, or Wiremold.

2.8 SPIN-IN FITTINGS:

A. Consist of a round galvanized sheet metal collar with a groove designed to allow the fitting to screw into a mating hold.

B. With an extractor and manual-balancing damper with a locking quadrant operator.

C. Mounted with the extractor facing into the airstream. After insulation, a galvanized sheet metal strap shall be screwed to the duct and the fitting to ensure permanent, proper positioning of the fitting.

2.9 MANUAL DAMPERS AND DAMPER HARDWARE:

A. Splitter Dampers:

1. Constructed of not less than 20 gauge galvanized steel sheet.
2. The length of the damper blade shall be the same as the width of the widest duct section at the split, but in no case shall be blade length be less than 12 inches.

B. Manual Volume Control Dampers:

1. Single blade butterfly dampers:
   a. Use in ducts up to and including 18"x12" size
   b. Constructed of not less than 16 gauge galvanized steel blade mounted in a galvanized steel frame.
   c. For rectangular dampers, the top and bottom edges of the blade shall be crimped to stiffen the blade.
   d. Provide an extended rod to permit installation of a damper regulator.

2. Multi-louver dampers:
   a. Use in ducts larger than 18"x12", in either or both dimensions.
   a. Opposed blade type, constructed of not less than 16 gauge galvanized steel blades mounted in a galvanized steel channel frame. Blade spacing shall not exceed 6", and the top and bottom edges of the blades shall be crimped to stiffen the blades. Damper blades shall be interconnected by rods and linkages to provide simultaneous operation of all blades. Damper shall be provided with an extended rod to permit installation of a damper regulator.

3. Dampers for outside air intake or relief:
   a. Edge and jamb seals
   b. Rated at less than 1% leakage when tested at 2" water.

2.10 AIR DISTRIBUTION DEVICES:

A. Diffusers:
1. Complete with pattern adjustment device, straightening vanes and volume control dampers.
2. Diffuser back plate shall transition smoothly from neck size to full-face size.
3. Straightening vanes and dampers are not required where diffusers are attached to round flexible ductwork.
4. Internal parts of diffusers shall be secured so that they can be removed and assembled without special tools.

B. Grilles and registers:
1. Felt or rubber gaskets cemented to the back face
2. Holding screws not over 18 inches on centers around the perimeter.
3. Grilles passing air through partitions: as described for wall return grilles, 1 for each side partition.

C. Frame types of diffusers and ceiling return grilles:
1. Match ceiling type(s) as indicated on architectural drawings.
2. In lay-in ceilings, size to lay in a nominal 24 inch x 24 inch grid opening.

D. Registers: The same as grilles, with opposed blade damper.

E. Finishes:
1. Factory applied
2. Steel construction: off white baked enamel.
3. Aluminum construction, ceiling mounted: off white baked enamel.
4. Aluminum construction, linear diffusers and bar grilles: exposed surfaces to be clear anodized aluminum, interiors to be flat black.
5. Aluminum construction: clear anodized aluminum.

F. **All distribution devices located in resident rooms shall have tamper-proof fasteners.**

G. Anemostat, Carnes, Titus, Tuttle & Bailey, Krueger, Metalaire.

2.11 FIRE DAMPERS:

A. Fire Dampers:
1. Factory fabricated curtain type
2. Constructed and tested in accordance with UL Safety standard 555.

3. Rated for 1-1/2 hour unless noted otherwise.
4. Manufacturer: provide instructions for installation conforming to manner in which dampers were approved by UL.

B. Frames:
1. Connected to ductwork: "B" frame.
2. In transfer openings in walls shall be "A" frame.

C. Fusible link rating:
1. In supply ducts: 160 degrees F
2. In return ducts: 135 degrees F .
3. In other locations: approximately 50 degrees F above maximum temperature normally encountered with system in operation or shutdown.

D. Ruskin, Dowco, Nailor Hart, Prefco, National Controlled Air.

2.12 SMOKE DAMPERS

A. Smoke dampers:
1. Multiblade type combination fire and smoke dampers
2. Meet all requirements of fire dampers as specified above.
3. Complete with sleeve and damper actuator installed on exterior of sleeve.

B. Actuator:
1. Specified under section 15900 " AUTOMATIC CONTROLS"
2. Spring return fail closed type that will close upon power failure.

C. Ruskin, Dowco, Nailor Hart, Prefco, National Controlled Air.

PART 3 EXECUTION

3.1 SHEETMETAL WORK - GENERAL

A. Install access panels on entering side of all turning vanes, fire dampers, control dampers and other locations where cleaning, oiling, inspection or maintenance are required. Locate access doors in bottom or side of ducts for ease of access.

B. Provide supplemental stiffening on ducts and apparatus casings to prevent drumming and to provide a structurally sound assembly.

C. Interior of ducts shall be smooth with joints caulked or sealed with duct sealer. The entire air system shall be rigid, free from rattles and air noises.

D. Arrange ductwork connections to mechanical equipment to avoid restricting access to panels which must be removed for servicing or cleaning of unit.

E. Provide auxiliary frames set flush with the plaster line for outlets in plaster.

F. Install exposed ductwork in finished areas tight to structure.

G. Ductwork installed exterior to the building shall have two coats of waterproof mastic applied to prevent water penetration.

H. Branch takeoffs to flexible ducts shall be made using spin in fittings. Branch take-offs shall not be located in the following locations: within 5 ft. downstream of an elbow, within 3 ft. of another take-off.

3.2 HANGERS AND SUPPORTS

A. In accordance with Section V (pages 5-1 through and including page 5-13) HANGERS AND SUPPORTS of the referenced SMACNA Standard, except:
   1. Hangers shall be spaced not over 8'-0" on centers.
   2. Longest dimensions up through 60":
      a. Galvanized steel strap type
      b. As scheduled in the SMACNA Standard, Table 5-1 (page 5-8).
   3. Longest dimension 61" and larger:
      a. Trapeze type constructed of galvanized steel angles with round hanger rods.
      b. Size as scheduled in the SMACNA Standard, Table 5-1 (page 5-8) for straphangers and Table 5-3 (pages 5-10)

B. Hangers for ducts suspended directly from the structure shall be screwed or "pop" riveted to the bottom and sides of the duct and secured to the structure by inserts, expansion shield bolts, beam clamps, welding, or bolting. Drive anchors shall not be installed in any location which will weaken the existing building. Install supplementary steel as required to bridge between joists and all supports shall be at joist panel points.

3.3 FLEXIBLE DUCTWORK

A. Install flexible ductwork in a fully extended condition, free of sags and kinks using the minimum length required to make connection. Maximum length of flexible duct shall be eight feet.

B. Support on a maximum of 4' centers with bands of 1" minimum width or wire through grommets furnished in seam of jacket.

3.4 GRILLES, REGISTERS, AND DIFFUSERS

A. Secure sidewall grilles and registers to duct with galvanized sheet metal screws.

B. Wall return and relief grilles installed above eye level shall have blades positioned so that inside of duct or the adjacent space will not be visible through the grille.

3.5 FIRE DAMPERS

A. Install damper in sleeve and install unit in wall using retaining angles. The installation shall be in accordance with the manufacturer's recommendation for complying with UL label.

B. Duct shall be connected to sleeve using slip type joints on top and bottom and a drive slip on each side so that duct can breakaway leaving damper and sleeve in wall or floor.

C. After installation prove damper operation by removing link and operating damper.

3.6 LOUVERS AND SCREENS

A. Secure to structure with bolts not over 8" on center.

B. After installation caulk top, bottom and sides to make installation watertight.

C. Provide angle frame as required to join connecting ductwork airtight to louver.

3.7 FIRE STOPPING

A. Pack sleeves through floors and firewalls with fire resistant material to prevent fire spread. Fire retardant sealant shall be asbestos free, UL classified, and shall meet ASTM E814-1983. Forming and backing material installed with the sealant shall be bulk ceramic fiber or rigid fiberboard rated for 2300^0F. Manufacturers: 3M CP-25 Caulk/ 3M 2001 foam Fire Barrier, Dow Corning or GE Silicone Foam, Hilti Firestop, Nelson Flameseal, Rectorseal Metacaulk, or Thompson & Betts Flame-Safe.

B. Plastic or insulated piping shall be fire stopped using an intumescent fire stopping system designed to expand under heat and seal the penetration. Dow Corning # 2002, 3M # FS-195/RC-1.

C. All fire stopping materials shall be installed in strict accordance with the manufacturer's recommendations and the listing requirements.

END OF SECTION 15 800

SECTION 15 900 - AUTOMATIC CONTROLS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Provide a complete system of temperature and safety controls for all mechanical equipment specified or shown on drawings. Controls shall be installed by trained mechanics in the direct employ of the controls manufacturer or the mechanical contractor. Controls shall be an integrated VVT type Digital control system. Control system shall be compatible with all components of the HVAC system, including VVT devices. Control system shall be provided by the HVAC equipment mfr.: Carrier, Trane.

B. The automatic temperature control (ATC) system shall be electric, electronic, or combination thereof; complete in every respect, including temperature sensors, thermostats, controllers, humidistats, bulb thermostats, automatic valves and valve actuators, automatic dampers (when not furnished integral with equipment) and damper actuators, control centers, switches, relays and accessories, as required on the drawings, diagrams and sequences of operation for a complete operable system.

C. The control system shall be installed, tested, calibrated and placed in complete operating order.

D. After completion of the original installation, provide any service incidental to the proper performance of the HVAC control system as deemed necessary by the architect for a period of one year. If, during that one year service period, any instrument or piece of equipment requires a substantial amount of service, it shall be replaced at no additional cost and service shall be extended for a period of one year after the replacement.

1.02 RELATED WORK:

A. The installation of motor starters, thermal overload switches, and power wiring for Mechanical equipment is specified under another division. This division includes mounting controls and all automatic control interlock and starting circuit wiring.

B. Refer to SECTION 15650 "HVAC EQUIPMENT" for control devices furnished with equipment.

1.03 SUBMITTALS

A. A complete separate wiring diagram for each system shall be submitted to the Architect for approval. Installation of control system shall not commence until submittal has been approved. Submittal shall include the following as a minimum:

1. Complete sequence of operation.
2. Data sheets for all hardware and software control components.
3. A description of the installation materials including conduit, wire, flex, etc.
4. Thermostat/sensor locations.
5. Computer panel locations.
6. Provide as part of the submittal two copies of all data and control drawings.

1.04 PRODUCTS FURNISHED UNDER THIS SECTION

A. Equipment Wiring Systems: Installation and connection of all power wiring. Power wiring shall be defined as follows:
   1. Wiring of power feeds through all disconnect starters and variable speed controllers to electric motors.
   2. 120 VAC Emergency power feeds to all critical CCS and/or temperature control panels.
   3. Wiring of any remote start/stop switches and manual or automatic motor speed control devices not furnished by the Control Contractor.

PART 2.0 PRODUCTS

2.01 MATERIALS:

A. Low voltage control wiring shall be not less than #18 plastic covered, color coded. Line voltage wiring shall not be smaller than #14 600 volt wire. All wire shall be run in conduit with outlet boxes and fittings as specified in Division 16. E.M.T. conduit may be used. All wiring shall be installed in strict accordance with NFPA-70 (1984) Article 725.

2.02 VVT SYSTEM:

A. The system shall consist of a multiple zone capacity programmable, communicating monitor thermostat, with multiple zone controllers, and a bypass controller. The system shall also include a complete array of sensors and input components. The system control devices shall be capable of stand-alone application or as a multiple system networked in a communication bus. The system components shall operate and be configurable without the use of a computer, but shall provide the capability of both local and remote net-work access through a computer. Carrier, Trane

B. The control system shall be available as a complete package, with the required input sensors and additional control components readily available. It shall provide complete control of the HVAC system including: unit, bypass airflow system, and zone control, Individual zones in the system shall have the capability to provide supplemental heat and pressure independent operation. Each device in the system shall be capable of "self-test" on-board diagnostics which communicate alarms and operating status. Unit control relay packs shall be available factory-installed with direct connection to the field-installed monitor thermostat.

C. Stand-Alone Capability: The system shall be capable of operating as a stand- alone system and not require a computer to prompt any functions for normal operation. The system shall be capable of interface to a computer either remotely or locally for purposes of diagnostics, programming, monitoring, and data logging.

D. Each Zone Damper shall include:
   1. A motorized damper assembly constructed of 24 gage galvanized iron with blade of 20 gage.
   2. Blade operation providing full modulation from open to closed position.
   3. The ability to operate in a master/slave arrangement, where the master damper is operated by the zone controller. The master damper shall have the capability to have up to 3 dampers tracking its position. The slave dampers shall modulate to the same position as the master damper.
   4. Round dampers shall have elliptical blades with a seal around the entire damper blade edge. Rectangular dampers shall have fully sealed edges.

5. A duct temperature sensor shall be an integral part of the damper assembly.

E. SOFTWARE
1. Access capability to the system, whether local or remote, shall be accomplished using the Carrier System Software. Software access shall not require any changes or modifications to the VVT control devices or associated system sensors.
1. The software shall be capable of, but not limited to:
listing all current system sensor readings, listing and modifying configuration parameters such as occupancy schedules, set points, alarm options, and temperature limits.
2. The software shall be capable of providing levels of access into the system from simple monitoring to full monitoring and modifying system configurations for all components.

F. SERVICE AND WARRANTY
1. After installation, system start-up shall be completed All thermostats and related components will be adjusted. The equipment being controlled by the specified control system shall be in operation and fully checked. The entire system must be in operation for 24 hours prior to seeking acceptance from the owner/engineer.
2. The control system herein specified shall be free from defects in workmanship and material under normal use and service. If, within 12 months from date of acceptance by owner/engineer, any of the equipment herein described is proved to be defective in workmanship or material, it will be repaired, adjusted, or replaced free of charge by the installing contractor.

2.03 MISC. DEVICES:

A. FIRESTATS: electric manual reset type, with settings not more than 50^{o}F above the normal maximum temperature at their location.

B. SMOKE DETECTORS: manual reset ionization type for duct installation in compliance with NFPA 90A, complete with sampling tubes, detector head, pilot light and necessary number of NO/NC contacts for sequences specified. Where a fire alarm system is provided, coordinate requirements for smoke detectors with fire alarm manufacturer.

C. Provide other materials as specified hereinafter and all controls accessories necessary for completely functional system operating according to the specified sequences.

PART 3 - EXECUTION

3.01 GENERAL:

A. Wall mounted thermostats shall be mounted centered on light switches. at ADA height.

B. Damper actuators shall be mounted parallel to building structure. Adjust actuators to pull damper fully closed. Provide sufficient number of actuators to accomplish this.

C. Bulbs strapped on to uninsulated piping shall have 1" thick fiberglass covering.

3.02 HEAT & SMOKE CONTROL:

A. Air conditioning system with a supply air capacity of 2,000 CFM or less shall have a firestat

located in the supply air ductwork to stop the unit when the duct air temperature exceeds 125°F.

B. Air conditioning systems with a supply air capacity of 2,000 CFM to 15,000 CFM shall have a smoke detector located in the main return duct to automatically stop the fan upon detection of products of combustion in the air stream. Smoke detector shall be as specified in NFPA 72E, or (6) duct widths from the last return air opening.

C. Additional controls shall be provided to meet local codes.

3.03 SEQUENCE OF OPERATION

A. The VVT System shall control the HVAC units in the following manner:

1. The VVT monitor thermostat shall determine (lie demand for heating or cooling based on the number of zones calling or the greatest demand for a particular mode. The VVT monitor thermostat will establish the zone with the greatest demand as the Reference Zone.

1. The VVT monitor thermostat shall communicate with its zone controllers and bypass controller on a communication bus network.

2. The VVT monitor thermostat shall access zone demand for heating and cooling from each zone slave thermostat and use this information to control the HVAC unit based on zone demand.

3. When any thermostat senses a temperature deviation of 1.5! F or more from its current set point, it becomes a zone heating or cooling caller. When a zone becomes a caller, the monitor thermostat registers its demand and its heating or cooling caller status. When the monitor thermostat registers the minimum required number of zone callers, as determined by the system mode demand, a mode is selected. The mode selected shall meet all lockout temperature criteria (if applicable). The monitor thermostat shall energize that specific mode.

4. On a rise to 2! F the monitor thermostat shall energize second stage if the temperature trending program allows second stage operation. When demand falls to 1.0! F, the second stage is released. When demand falls to 0.5! F, the first stage is released.

5. The monitor thermostat shall hold the system mode until the Reference Zone is within .5! F of its set point or until the system mode reselect time limit has expired and the system demand is such that the monitor thermostat selects the opposite mode.

6. The bypass controller shall pre-position its dampens) to the maximum open position prior to system start-up. The bypass controller shall regulate pressure from minimum system pressure during start-up to maximum system pressure during normal operating conditions. The bypass controller shall monitor supply air temperature. During changeover mode, the bypass controller shall open the bypass dampers to pre-condition the supply air if it is needed by the Reference Zone.

7. The individual zone controllers shall be capable of operating in the ventilation mode until the zone becomes 1.5! F out of set point in either direction. At this point the zone controller shall request the appropriate mode from the monitor thermostat.

B. EXHAUST FANS

1. Exhaust fans serving public toilet shall be controlled to operate with the HVAC system from the Owner's central control system.
2. Exhaust fans serving private toilets shall be interlocked with lights in that room.
3. Exhaust fans serving equipment rooms shall be operated from a space thermostat.

C. KITCHEN VENTILATION SYSTEMS:

1. Kitchen ventilation systems will operate from a pilot-lit switch on the hood face. The

heating section of the make-up air unit will be controlled from a space temperature sensor in the kitchen.

3.04 VVT SYSTEM

A. Install per manufacturer's instructions.

B. Mount VVT devics to provide access to controls and operators.

C. Route inlet duct straight for a minimum of 3 duct diameters ahead of the damper.

3.05 SYSTEM CHECK-OUT

A. Check-out each system for control function through entire sequence, check calibration of instruments, reset instrument control points.

B. Owner maintenance personnel shall be made thoroughly familiar with the operation and service of the project automatic temperature control circuits.

END OF SECTION 15 900

SECTION 15 991 - TEST, ADJUST AND BALANCE

A. TAB will be responsible to carry out the commissioning requirements specified in Section 15995, 17200 and other sections referenced in 17 200.

1. QUALIFICATIONS OF TAB CONTRACTOR AND LEAD TECHNICIAN

A. The Contractor will provide the services of a qualified test and balance contractor. The qualifications of the TAB contracting firm shall be submitted, along with the specific qualifications of the lead site technician who will remain on site during all TAB work, within **7 days of notice to proceed**. Recent projects shall be listed and described for both the company and the lead technician. Names and telephone numbers of the project contractors and facility managers will be provided.

D. The Owner must approve in writing the qualifications of both the company and the lead technician.

END OF SECTION 15 991

SECTION 15 995 - MECHANICAL SYSTEMS COMMISSIONING

TABLE OF CONTENTS (with selected subheadings)

1.1 Description
1.2 Responsibilities
- A. All Division 15 Contractors (Mechanical, Controls and TAB)
- B. Mechanical Contractor
- C. Controls Contractor
  1. Sequences of Operations Submittal
  2. Controls Drawings Submittal
  3. As-builds
  4. Required Assistance to TAB
  5. Required Assistance to the CA
  6. Written Agenda
  7. Checkout Certification
  8. Additional Control Points
- D. TAB Contractor
- E. Mechanical Designer

1.3 Related Work
2.1 Test Equipment
3.1 Submittals
3.2 Startup
3.3 TAB
3.4 Functional Performance Tests
3.5 Testing Documentation, Non-Conformance and Approvals
3.6 Operation and Maintenance Manuals
- D. Special Control System O&M Manual Requirements

3.7 Training of Owner Personnel
- C. Mechanical Contractor
- D. Controls Contractor
- E. TAB Contractor

3.8 Deferred Testing
3.9 Written Work Products

PART 1 - GENERAL

1.1 DESCRIPTION

A. The purpose of this section is to specify Division 15 responsibilities in the commissioning process.

B. The systems to be commissioned are listed in Section 17200.1.7.

C. Commissioning requires the participation of Division 15 to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in Division 17. Division 15 shall be familiar with all parts of Division 17 and the commissioning plan issued by the CA and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

1.2 RESPONSIBILITIES

A. Mechanical, Controls and TAB Contractors. The commissioning responsibilities applicable to each of the mechanical, controls and TAB contractors of Division 15 are as follows (all references apply to commissioned equipment only):

Construction and Acceptance Phases

1. Include and itemize the cost of commissioning in the contract price.
2. In each purchase order or subcontract written, include requirements for submittal data, commissioning documentation, O&M data and training.
3. Attend a commissioning scoping meeting and other meetings necessary to facilitate the Cx process.
4. Contractors shall provide the CA with normal cut sheets and shop drawing submittals of commissioned equipment.
5. Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of start-up and functional testing procedures.
    a. Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.
    b. The Commissioning Agent may request further documentation necessary for the commissioning process.
    c. This data request may be made prior to normal submittals.
6. Provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review and approval.
7. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

8. Provide limited assistance to the CA in preparing the specific functional performance test procedures as specified in Section 15997. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.

9. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists from the CA for all commissioned equipment. Submit to CA for review and approval prior to startup. Refer to Section 17200 for further details on start-up plan preparation.
10. During the startup and initial checkout process, execute the mechanical-related portions of the prefunctional checklists for all commissioned equipment.
11. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.
12. Address current A/E punch list items before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.
13. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
14. Provide skilled technicians to perform functional performance testing under the direction of the CA for specified equipment in Section 15997 and 17200. Assist the CA in interpreting the monitoring data, as necessary.
15. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, CM and A/E and retest the equipment.
16. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
17. During construction, maintain as-built red-line drawings for all drawings and final CAD as-builts for contractor-generated coordination drawings. Update after completion of commissioning (excluding deferred testing).
18. Provide training of the Owner's operating staff using expert qualified personnel, as specified.
19. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

Warranty Period

1. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
2. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

B. Mechanical Contractor. The responsibilities of the HVAC mechanical contractor, during construction and acceptance phases in addition to those listed in (A) are:

1. Provide startup for all HVAC equipment, except for the building automation control system.
2. Assist and cooperate with the TAB contractor and CA by:

    a. Putting all HVAC equipment and systems into operation and continuing the operation during each working day of TAB and commissioning, as required.
    b. Including cost of sheaves and belts that may be required by TAB.

c. Providing test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing. Providing an approved plug.
d. Providing temperature and pressure taps according to the Construction Documents for TAB and commissioning testing.

3. Install a P/T plug at each water sensor which is an input point to the control system.
4. List and clearly identify on the as-built drawings the locations of all air-flow stations.

5. Prepare a preliminary schedule for Division 15 pipe and duct system testing, flushing and cleaning, equipment start-up and TAB start and completion for use by the CA. Update the schedule as appropriate.
6. Notify the CM or CA depending on protocol, when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and TAB will occur. Be responsible to notify the CM or CA, ahead of time, when commissioning activities not yet performed or not yet scheduled will delay construction. Be proactive in seeing that commissioning processes are executed and that the CA has the scheduling information needed to efficiently execute the commissioning process.

C. Controls Contractor. The commissioning responsibilities of the controls contractor, during construction and acceptance phases in addition to those listed in (A) are:

1. Sequences of Operation Submittals. The Controls Contractor's submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications. They shall include:
   a. An overview narrative of the system (1 or 2 paragraphs) generally describing its purpose, components and function.
   b. All interactions and interlocks with other systems.
   c. Detailed delineation of control between any packaged controls and the building automation system, listing what points the BAS monitors only and what BAS points are control points and are adjustable.
   d. Written sequences of control for packaged controlled equipment. (Equipment manufacturers' stock sequences may be included, but will generally require additional narrative).
   e. Start-up sequences.
   f. Warm-up mode sequences.
   g. Normal operating mode sequences.
   h. Unoccupied mode sequences.
   i. Shutdown sequences.
   j. Capacity control sequences and equipment staging.
   k. Temperature and pressure control: setbacks, setups, resets, etc.
   l. Detailed sequences for all control strategies, e.g., economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
   m. Effects of power or equipment failure with all standby component functions.
   n. Sequences for all alarms and emergency shut downs.
   o. Seasonal operational differences and recommendations.
   p. Initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
   q. Schedules, if known.

r. To facilitate referencing in testing procedures, all sequences shall be written in small statements, each with a number for reference. For a given system, numbers will not repeat for different sequence sections, unless the sections are numbered.

2. Control Drawings Submittal
   a. The control drawings shall have a key to all abbreviations.
   b. The control drawings shall contain graphic schematic depictions of the systems and each component.
   c. The schematics will include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
   d. Provide a full points list with at least the following included for each point:
      1) Controlled system
      2) Point abbreviation
      3) Point description
      4) Display unit
      5) Control point or setpoint (Yes / No)
      6) Monitoring point (Yes / No)
      7) Intermediate point (Yes / No)
      8) Calculated point (Yes / No)

      Key:

      Point Description: DB temp, airflow, etc.

      Control or Setpoint: Point that controls equipment and can have its setpoint changed (OSA, SAT, etc.)

      Intermediate Point: Point whose value is used to make a calculation which then controls equipment (space temperatures that are averaged to a virtual point to control reset).

      Monitoring Point: Point that does not control or contribute to the control of equipment, but is used for operation, maintenance, or performance verification.

      Calculated Point: "Virtual" point generated from calculations of other point values.

      The Controls Contractor shall keep the CA informed of all changes to this list during programming and setup.
3. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls O&M manual submittal.

4. Assist and cooperate with the TAB contractor in the following manner:

   a. Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).
   b. For a given area, have all required prefunctional checklists, calibrations, startup and selected functional tests of the system completed and approved by the CA prior to TAB.
   c. Provide a qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.

5. Assist and cooperate with the CA in the following manner:

a. Using a skilled technician who is familiar with this building, execute the functional testing of the controls system as specified for the controls contractor in Section 15997 and 16997. Assist in the functional testing of all equipment specified in Section 15997 and 16997. Provide two-way radios during the testing.
b. Execute all control system trend logs specified in Section 15997 and 16997.

6. The controls contractor shall prepare a written plan indicating in a step-by-step manner, the procedures that will be followed to test, checkout and adjust the control system prior to functional performance testing, according to the process in Section 17200. At minimum, the plan shall include for each type of equipment controlled by the automatic controls:

    a. System name.
    b. List of devices.
    c. Step-by-step procedures for testing each controller after installation, including:
        1) Process of verifying proper hardware and wiring installation.
        2) Process of downloading programs to local controllers and verifying that they are addressed correctly.
        3) Process of performing operational checks of each controlled component.
        4) Plan and process for calibrating valve and damper actuators and all sensors.
        5) A description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.
    d. A copy of the log and field checkout sheets that will document the process. This log must include a place for initial and final read values during calibration of each point and clearly indicate when a sensor or controller has “passed” and is operating within the contract parameters.
    e. A description of the instrumentation required for testing.
    f. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the CA and TAB contractor for this determination.
7. Provide a signed and dated certification to the CA and CM upon completion of the checkout of each controlled device, equipment and system prior to functional testing for each piece of equipment or system, that all system programming is complete as to all respects of the Contract Documents, except functional testing requirements.
8. Beyond the control points necessary to execute all documented control sequences, provide monitoring, control and virtual points as specified in Section 15950.
9. List and clearly identify on the as-built duct and piping drawings the locations of all static and differential pressure sensors (air, water and building pressure).

D. TAB Contractor. The duties of the TAB contractor, in addition to those listed in (A) are:

1. Six weeks prior to starting TAB, submit to the CM the qualifications of the site technician for the project, including the name of the contractors and facility managers of recent projects the technician on which was lead. The Owner will approve the site technician’s qualifications for this project.
2. Submit the outline of the TAB plan and approach for each system and component to the CA, CM and the controls contractor six weeks prior to starting the TAB. This plan will be developed after the TAB has some familiarity with the control system.
3. The submitted plan will include:

a. Certification that the TAB contractor has reviewed the construction documents and the systems with the design engineers and contractors to sufficiently understand the design intent for each system.
b. An explanation of the intended use of the building control system. The controls contractor will comment on feasibility of the plan.
c. All field checkout sheets and logs to be used that list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
e. Final test report forms to be used.
f. Detailed step-by-step procedures for TAB work for each system and issue: terminal flow calibration (for each terminal type), diffuser proportioning, branch / submain proportioning, total flow calculations, rechecking, diversity issues, expected problems and solutions, etc. Criteria for using air flow straighteners or relocating flow stations and sensors will be discussed. Provide the analogous explanations for the water side.
g. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
h. Details of how *total* flow will be determined (Air: sum of terminal flows via BAS calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations. Water: pump curves, circuit setter, flow station, ultrasonic, etc.).
i. The identification and types of measurement instruments to be used and their most recent calibration date.
j. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and provide methods to verify this.
k. Confirmation that TAB understands the outside air ventilation criteria under all conditions.
l. Details of whether and how minimum outside air cfm will be verified and set, and for what level (total building, zone, etc.).
m. Details of how building static and exhaust fan / relief damper capacity will be checked.
n. Proposed selection points for sound measurements and sound measurement methods.
o. Details of methods for making any specified coil or other system plant capacity measurements.
p. Details of any TAB work to be done in phases (by floor, etc.), or of areas to be built out later.
q. Details regarding specified deferred or seasonal TAB work.
r. Details of any specified false loading of systems to complete TAB work.
s. Details of all exhaust fan balancing and capacity verifications, including any required room pressure differentials.
t. Details of any required interstitial cavity differential pressure measurements and calculations.
u. Plan for hand-written field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
v. Plan for formal progress reports (scope and frequency).
w. Plan for formal deficiency reports (scope, frequency and distribution).

4. A running log of events and issues shall be kept by the TAB field technicians. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests to the CA and CM at least twice a week.
5. Communicate in writing to the controls contractor all setpoint and parameter changes made or problems and discrepancies identified during TAB which affect the control system setup and operation.
6. Provide a draft TAB report within two weeks of completion. A copy will be provided to the CA. The report will contain a full explanation of the methodology, assumptions and the results in a clear format with designations of all uncommon abbreviations and column headings. The report should follow the latest and most rigorous reporting recommendations by AABC, NEBB or ASHRAE Standard 111.
7. Provide the CA with any requested data, gathered, but not shown on the draft reports.
8. Provide a final TAB report for the CA with details, as in the draft.
9. Conduct functional performance tests and checks on the original TAB as specified for TAB in Section 15997.

E. Mechanical Designer. Refer to Section 17 200 for the responsibilities of the mechanical designer.

1.3 RELATED WORK

A. Refer to Section 17200, Part 1.5 for a listing of all sections where commissioning requirements are found.

B. Refer to Section 17200 Part 1.4 for systems to be commissioned and section 17200 Part 1.6 and 15997 for functional testing requirements.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Division 15 shall provide all test equipment necessary to fulfill the testing requirements of this Division.

B. Refer to Section 17 200 Part 2.1 for additional Division 15 requirements.

PART 3 - EXECUTION

3.1 SUBMITTALS

A. Division 15 shall provide submittal documentation relative to commissioning as required in this Section Part 1, Section 01300 and Section 17200.

3.2 STARTUP

A. The HVAC mechanical and controls contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this section and in 17 200. Division 15 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning

procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the commissioning agent or Owner.

B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CA and CM. Beginning system testing before full completion, does not relieve the Contractor from fully completing the system, including all prefunctional checklists as soon as possible.

3.3 TAB

A. Refer to the TAB responsibilities in Part 1.2 above.

3.4 FUNCTIONAL PERFORMANCE TESTS

A. Refer to Section 17200 Part 1.4 for a list of systems to be commissioned and to Part 3.6 for a description of the process and to Section 15997 for specific details on the required functional performance tests.

3.5 TESTING DOCUMENTATION, NON-CONFORMANCE AND APPROVALS

A. Refer to Section 17200 Part 3.4 for specific details on non-conformance issues relating to prefunctional checklists and tests.

B. Refer to Section 17200 Part 3.7 for issues relating to functional performance tests.

3.6 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these specifications.

B. Division 15 shall compile and prepare documentation for all equipment and systems covered in Division 15 and deliver this documentation to the GC for inclusion in the O&M manuals, according to this section and Section 01730, prior to the training of owner personnel.

C. The CA shall receive a copy of the O&M manuals for review.

D. Special Control System O&M Manual Requirements. In addition to documentation that may be specified elsewhere, the controls contractor shall compile and organize at minimum the following data on the control system in labeled 3-ring binders with indexed tabs.

1. Three copies of the controls training manuals in a separate manual from the O&M manuals.
2. Operation and Maintenance Manuals containing:

    a. Specific instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. These instructions shall be step-by-step. Indexes and clear tables of contents shall be included. The detailed technical manual for programming and customizing control loops and algorithms shall be included.
    b. Full as-built set of control drawings (refer to Submittal section above for details).
    c. Full as-built sequence of operations for each piece of equipment.

d. Full points list. In addition to the updated points list required in the original submittals (Part 1 of this section), a listing of all rooms shall be provided with the following information for each room:
   1) Floor
   2) Room number
   3) Room name
   4) Air handler unit ID
   5) Reference drawing number
   6) Air terminal unit tag ID
   7) Heating and/or cooling valve tag ID
   8) Minimum cfm
   9) Maximum cfm

e. Full print out of all schedules and set points after testing and acceptance of the system.
f. Full as-built print out of software program.
g. Electronic copy on disk of the entire program for this facility.
h. Marking of all system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.
i. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
j. Control equipment component submittals, parts lists, etc.
k. Warranty requirements.
l. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).

3. The manual shall be organized and subdivided with permanently labeled tabs for each of the following data in the given order:
   a. Sequences of operation
   b. Control drawings
   c. Points lists
   d. Controller / module data
   e. Thermostats and timers
   f. Sensors and DP switches
   g. Valves and valve actuators
   h. Dampers and damper actuators
   i. Program setups (software program printouts)

4. Field checkout sheets and trend logs should be provided to the CA for inclusion in the Commissioning Record Book.

E. Special TAB Documentation Requirements. The TAB will compile and submit the following with other documentation that may be specified elsewhere in the *Specifications.*

1. Final report containing an explanation of the methodology, assumptions, test conditions and the results in a clear format with designations of all uncommon abbreviations and column headings.
2. The TAB shall mark on the drawings where all traverse and other critical measurements were taken and cross reference the location in the TAB report.

F. Review and Approvals. Review of the commissioning related sections of the O&M manuals shall be made by the A/E and by the CA. Refer to Section 17200, Part 3.8 for details.

3.7. TRAINING OF OWNER PERSONNEL

A. The GC shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed. Refer to Section 17200 for additional details.

B. The CA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment. Refer to Section 17200 for additional details.

C. Mechanical Contractor. The mechanical contractor shall have the following training responsibilities:

1. Provide the CA with a training plan two weeks before the planned training according to the outline described in Section 17200, Part 3.9.
2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of HVAC equipment including, but not limited to, pumps, boilers, furnaces, chillers, heat rejection equipment, air conditioning units, air handling units, fans, terminal units, controls and water treatment systems, etc.
3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer’s representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
6. The controls contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
7. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
8. Training shall include:

    a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
    b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
    c. Discussion of relevant health and safety issues and concerns.
    d. Discussion of warranties and guarantees.
    e. Common troubleshooting problems and solutions.
    f. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.
    g. Discussion of any peculiarities of equipment installation or operation.

h. The format and training agenda in *The HVAC Commissioning Process, ASHRAE Guideline 1-1989R*, 1996 is recommended.
i. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.

9. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.
10. The mechanical contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not *controlled* by the central control system.
11. Training shall occur after functional testing is complete, unless approved otherwise by the Project Manager.
12. Duration of Training. The mechanical contractor shall provide training on each piece of equipment according to the following schedule.

Hours	System
_____	Air Handler Units
_____	Supplementary Supply Fans
_____	Return Fan/Relief Fan
_____	Air Terminal Units
_____	Air Handler Units
_____	Specialty Exhaust Fans
_____	Restroom Central Exhaust Fans
_____	Service Hot Water Heaters
_____	Fire Protection System
_____	Fire Sprinklers
_____	Irrigation

D. Controls Contractor. The controls contractor shall have the following training responsibilities:

1. Provide the CA with a training plan four weeks before the planned training according to the outline described in Section 17200, Part 3.9.
2. The controls contractor shall provide designated Owner personnel training on the control system in this facility. The intent is to clearly and completely instruct the Owner on all the capabilities of the control system.
3. Training manuals. The standard operating manual for the system and any special training manuals will be provided for each trainee, with three extra copies left for the O&M manuals. In addition, copies of the system technical manual will be demonstrated during training and three copies submitted with the O&M manuals. Manuals shall include detailed description of the subject matter for each session. The manuals will cover all control sequences and have a definitions section that fully describes all relevant words used in the manuals *and* in all software displays. The CA will approve manuals. Copies of audiovisuals shall be delivered to the Owner.
4. The trainings will be tailored to the needs and skill-level of the trainees.
5. The trainers will be knowledgeable on the system and its use in buildings. For the on-site sessions, the most qualified trainer(s) will be used. The Owner shall approve the instructor prior to scheduling the training.
6. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.

7. The controls contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
8. There shall be three training sessions:

   a. Training I. Control System. The first training shall consist of 8 hours of actual training. This training may be held on-site or in the supplier's facility. If held off-site, the training may occur prior to final completion of the system installation. Upon completion, each student, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.

   b. Training II. Building Systems. The second session shall be held on-site for a period of 4 hours of actual hands-on training after the completion of system commissioning. The session shall include instruction on:
      1) Specific hardware configuration of installed systems in this building and specific instruction for operating the installed system, including HVAC systems, lighting controls and any interface with security and communication systems.
      2) Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
      3) All trending and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends. Trainees will actually set-up trends in the presence of the trainer.
      4) Every screen shall be completely discussed, allowing time for questions.
      5) Use of keypad or plug-in laptop computer at the zone level.
      6) Use of remote access to the system via phone lines or networks.
      7) Setting up and changing an air terminal unit controller.
      8) Graphics generation
      9) Point database entry and modifications
      10) Understanding DDC field panel operating programming (when applicable)

   c. Training III. The third training will be conducted on-site six months after occupancy and consist of 2 hours of training. The session will be structured to address specific topics that trainees need to discuss and to answer questions concerning operation of the system.

E. TAB The TAB contractor shall have the following training responsibilities:

1. TAB shall meet for 4 hours with facility staff after completion of TAB and instruct them on the following:
   a) Go over the final TAB report, explaining the layout and meanings of each data type.
   b) Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.

c) Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
d) Discuss any temporary settings and steps to finalize them for any areas that are not finished.
e) Other salient information that may be useful for facility operations, relative to TAB.

3.8. DEFERRED TESTING

A. Refer to Section 17200, Part 3.10 for requirements of deferred testing.

3.9 WRITTEN WORK PRODUCTS

A. Written work products of Contractors will consist of the start-up and initial checkout plan described in Section 17200 and the filled out start-up, initial checkout and prefunctional checklists.

END OF SECTION 15 995

SECTION 15 997 - MECHANICAL TESTING REQUIREMENTS

PART 1 - GENERAL

1.1. INCLUDED SYSTEMS AND EQUIPMENT

A. The following is a list of the equipment and system test requirements included in this section:
1. Air handler system
2. Building automation system
3. Exhaust fans
4. Indoor air climate control--misc. systems
5. Indoor air quality (IAQ)
6. Packaged DX air conditioning or heat pump
7. Service hot water system
8. Terminal unit (VVT)
9. Test and balance (TAB) work

1.2 DESCRIPTION

A. This section specifies the functional testing requirements for Division 15 systems and equipment. From these requirements, the Commissioning Authority (CA) shall develop step-by-step procedures to be executed by the Subs or the Commissioning Authority. The general functional testing process, requirements and test method definitions are described in Section 17200. The test requirements for each piece of equipment or system contain the following:
1. The contractors responsible to execute the tests, under the direction of the CA.
2. A list of the integral components being tested.
3. Prefunctional checklists associated with the components.
4. Functions and modes to be tested.
5. Required conditions of the test for each mode.
6. Special procedures.
7. Required methods of testing.
8. Required monitoring.
9. Acceptance criteria.
10. Sampling strategies allowed.

1.3 PREREQUISITES

The following applicable generic prerequisite checklist items are required to be listed on each written functional test form and be completed and checked off by CA prior to functional testing.

__ All related equipment has been started up and start-up reports and prefunctional checklists submitted and approved ready for functional testing:
__ All control system functions for this and all interlocking systems are programmed and operable per contract documents, including final setpoints and schedules with debugging, loop tuning and sensor calibrations completed.

_____ _____
Controls Contractor Signature or Verbal Date

__ Piping system flushing complete and required report approved.
__ Test and balance (TAB) complete and approved for the hydronic system.
__ All A/E punchlist items for this equipment corrected.

__ These functional test procedures reviewed and approved by installing contractor.
__ Safeties and operating ranges reviewed by the CA.
__ Test requirements and sequences of operation attached.
__ Schedules and setpoints attached.
__ False loading equipment, system and procedures ready.
__ Sufficient clearance around equipment for servicing.
__ Record of all values for pre-test setpoints changed to accomodate testing has been made and a check box provided to verify return to original values (control parameters, limits, delays, lockouts, schedules, etc.).
__ Other miscellaneous checks of the prefunctinal checklist and start-up reports completed successfully.

1.4 MONITORING

a. Monitoring is a method of testing as a stand-alone method or to augment manual testing.
b. All points listed in the required monitoring section of the test requirements which are control system monitored points shall be trended by the controls contractor. Other points shall be monitored by the CA using dataloggers. At the option of the CA, some control system monitoring may be replaced with datalogger monitoring. At the CA's request, the controls contractor shall trend up to 20% more points than listed herein at no extra charge.
c. Hard copies of monitored data must be in columnar format with time down the left column and at least 5 columns of point values on the same page.
d. Graphical output is desirable, and will be required for all output, if the system can produce it.

PART 2 - PRODUCTS

-- NOT APPLICABLE --

PART 3 - EXECUTION

1. AIR HANDLER UNITS (AHU)

A. Parties Responsible to Execute Functional Test
   1. Controls contractor: operate the controls to activate the equipment as needed.
   2. CA: to witness, direct and document testing.

B. Integral Components or Related Equipment Being Tested — Prefunctional Checklist ID
   1. AHU and components (fans, coils, valves, ducts, VFD) — PC-m1

C. Prerequisites The applicable prerequisite checklist items listed in the beginning of Section 15997 shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions / Modes Required To Be Tested, Test Methods and Seasonal Test Requirements
The following testing requirements are an addition to and do not replace any testing requirements elsewhere in this Division.

Function / Mode	Test Method Manual, Monitoring, Either or Both[3]	Required Seasonal Test[1]
General 1. Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, unnoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks with which it is associated.	Manual	
In addition to, or as part of (1) above, the following modes or tests are required:		
2. Mixed & supply air, & reset temperature control functions.	Both	
3. Economizer functions.	Both	Cooling
4. SF, RF and exhaust fan interlocks.	Either	
5. No CCV flow when there is HCV flow.	Both	
6. CCV & HCV modulation & positive shutoff (no leak-thru).	Manual	
7. Duct static pressure (SP) control.	Both	
8. Return or exhaust fan tracking and building SP.	Monitoring	
9. VFD (or inlet vanes) operation on SF and RF: modulation to minimum, control system PID, proportional band of speed vs controlling parameter, constancy of static pressure, verification of program settings, alarms, etc.	Both	[2]
10. Damper interlocks and correct modulation in all modes, including smoke and fire dampers.	Manual	
11. Temperature difference across HC & CC per specifications.	Manual	
12. Verification of minimum OSA control through varying VVT box positions.	Either	[2]
13. Heating and cooling coils freeze protection.	Manual	[2]
14. Branch duct control damper control.	Manual	
15. Night low limit, morning warmup cycle.	Either	
16. Heat recovery operation.	Monitoring	
17. Verify TAB reported SF cfm with control system reading.	Manual	[2]
18. All alarms (low limits, high static, etc.).	Manual	
19. Heating and cooling coil capacity test, optional.	Manual	Design
20. Sensor and actuator calibration checks: on duct static pressure sensor on SAT, MAT, OSAT, OSA & RA damper and valve positions, SF cfm reading with TAB, and other random checks (EMS readout against hand-held calibrated instrument or observation must be within specified tolerances)	Manual	
21. Verify schedules and setpoints to be reasonable and appropriate		

[1]Cooling season, Heating season or Both. "Design" means within 5°of season design (ASHRAE 2 1/2%), or 95% of loading design. A blank cell denotes no special seasonal test is required and that test can be executed during any season, if condition simulation is appropriate.
[2]Seasonal test not required if seasonal conditions can be adequately simulated.
[3]Refer to Special Procedures

E. Special Procedures (other equipment to test with, etc.; reference to function ID)

1. Reduced Testing for Smaller Units. For standard application AHU's less than 15 tons, the following modifications to the testing requirements apply: 1) either Manual or Monitoring will satisfy the verification requirement--where Both is listed, choose one. 2) Testing Modes 6, 8, 11, 13 and 16 is not required.

F. Required Monitoring

1. All points listed below which are control system monitored points shall be trended by the controls contractor. Other points shall be monitored by the CA using dataloggers. Refer to the Monitoring section at the beginning of Section 15997 for additional monitoring details.

Point	Time Step (min.)	Minimum Time Period of Trend	Hard Copy? (Y/N)	ASCII File? (Y/N)	Function Being Tested
For each AHU being tested:					
RAT	5	5 days incl. weekend	Y	Y	1-3, 5
SAT	5	5 days incl. weekend	Y	Y	1-3, 5
CC LAT (optional)	5	5 days incl. weekend	Y	Y	1-3, 5
HC LAT (optional)	5	5 days incl. weekend	Y	Y	1-3, 5
MAT	5	5 days incl. weekend	Y	Y	1, 3
Indoor WB or enthalpy, if enthalpy economizer	5	5 days incl. weekend	Y	Y	1, 3
SF speed, if variable, else status	5	5 days incl. weekend	Y	Y	1, 5-9
RF speed, if variable, else status	5	5 days incl. weekend	Y	Y	1, 5-9
Duct SP	5	5 days incl. weekend	Y	Y	1, 7, 9
Building SP differential	5	5 days incl. weekend	Y	Y	8
OSAT	5	5 days incl. weekend	Y	Y	All
OSA-WB or enthalpy, if enthalpy economizer	5	5 days incl. weekend	Y	Y	1, 3
Indoor dry-bulb ___zones (expected to be most problematic)	5	5 days incl. weekend	Y	Y	All

Remarks:

CCV position (optional)
HCV position (optional)
SF cfm not required if not monitored
RF cfm not required if not monitored

G. Acceptance Criteria (referenced by function or mode ID)

1-21. For the conditions, sequences and modes tested, the AHU, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

2. AHU with supporting systems shall be able to maintain the SA temperature within 1.0F either side of the deadband of the current setpoint without excessive hunting.

7. AHU and controls shall control the duct static pressure so that it does not drift more than an amount equal to 10% of the setpoint value either side of the deadband without excessive hunting.

H. Sampling Strategy for Identical Units
1. All identical AHU's over 15 tons shall not have any sampling--test all units. However, 25% of the units may have monitoring be the verification method for modes listed with Monitoring or Both as testing methods, with no less than three units being fully tested per the above requirements.
2. All identical AHU's equal to or less than 15 tons shall be sampled: Randomly test at least 50% of each group of identical equipment (the 1st sample) per the above tests. In no case test less than three units in each group. If 20% of the units in the first sample fail the functional performance tests, test another the remaining 50%, fully at the contractor's expense. This sampling applies to the testing subsections. That is, if calibration is off on more than 10% of the tested piece of equipment, then another sample shall have calibrations checked, but not all other tests need to be done on the second sample.
3. All units not included in the sampling testing and monitoring shall be fully monitored for the monitoring modes listed above in the monitoring section.

2. BUILDING AUTOMATION SYSTEM (BAS)

A. Parties Responsible to Execute Functional Test
1. Controls contractor: operate the controls to activate the equipment.
2. CA: to witness, direct and document testing.

B.

Integral Components or Related Equipment Being Tested	Prefunctional Checklist ID
1. Building Automation System	PC-m2
2. All prefunctional checklists of controlled equipment	---

D. Prerequisites The applicable prerequisite checklist items listed in the beginning of Section 15997 shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

E. A significant part of the BAS functional testing requirements is the successful completion of the functional tests of equipment the BAS controls or interlocks with. Uncompleted equipment functional tests or outstanding deficiencies in those tests lend the required BAS functional testing incomplete.

F. Integral or stand-alone controls are functionally tested with the equipment they are attached to, including any interlocks with other equipment or systems and thus are not covered under the BAS testing requirements, except for any integrated functions or interlocks listed below.

G. In addition to the controlled equipment testing, the following tests are required for the BAS, where features have been specified. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in the specifications.

Function / Mode	Test Method Manual (demonstration), Monitoring, Either or Both

Function / Mode	Test Method Manual (demonstration), Monitoring, Either or Both
MISC. FUNCTIONS	
1. All specified functions and features are set up, debugged and fully operable	Verbal discussion of features
2. Power failure and battery backup and power-up restart functions	Demonstration
3. Specified trending and graphing features demonstration	See equipment trends
4. Global commands features	Demonstration
5. Security and access codes	Demonstration
6. Occupant over-rides (manual, telephone, key, keypad, etc.)	Demonstration
7. O&M schedules and alarms	Demonstration
8. Scheduling features fully functional and setup, including holidays	Observation in terminal screens or printouts
9. Date and time setting in central computer and verify field panels read the same time	Demonstration
10. Included features not specified to be setup are installed (list)	Demonstration
11. Occupancy sensors and controls	Demonstration
12. Demonstrate functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad	Demonstration of 100% of panels and 10% of ports
13. All graphic screens and value readouts completed	Demonstration
14. Setpoint changing features and functions	Done during equipment testing
15. Communications to remote sites	Demonstration
16. Sensor calibrations	Sampled during equipment tests
17. “After hours” use tracking and billing	
18. Final as-builts or redlines (per spec) control drawings, final points list, program code, setpoints, schedules, warranties, etc. per specs, submitted for O&Ms.	Observation
19. Verify that points that are monitored only, having no control function, are checked for proper reporting to BAS.	Observation
INTEGRATED TESTS	
20. Fire alarm interlocks and response	Demonstration
21. Duty cycling (if specified)	Monitoring
22. Demand limiting (including over-ride of limiting)	Monitoring
23. Sequential staging ON of equipment	Either
24. Optimum start-stop functions	Monitoring
25. All control strategies and sequences not tested during controlled equipment testing	Either
26. Other integrated tests specified in the contract documents	
27. Security system interlocks	Demonstration
28. Fire protection and suppression systems	Demonstration

H. Special Procedures (other equipment to test with, etc.; reference to function ID)
None

I. Additional Required Monitoring

1. Besides the trending and monitoring required with the functional testing of equipemint, all points listed below which are control system monitored points shall be trended by the controls contractor. Other points shall be monitored by the CA using dataloggers. Refer to the Monitoring section at the beginning of Section 15997 for additional monitoring details.

Point	Time Step (min.)	Minimum Time Period of Trend	Hard Copy? (Y/N)	ASCII File? (Y/N)	Function Being Tested
Misc. equipment current or status for duty cycling and demand limiting	5	5 days incl. weekend	Y	Y	21-22
Equipment or building kW or current for demand limiting	5	5 days incl. weekend	Y	Y	21-22
Optimum start/stop equip.	5	5 days incl. weekend	Y	Y	24

Remarks:

I. Acceptance Criteria (referenced by function or mode ID)

All For the conditions, sequences and modes tested, the BAS, integral components and related equipment respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

J. Sampling Strategy for Identical Units

1. Sample 10% of the field panels for procedure 9, and 10% of the local ports for procedure 12. If 10% fail, test another 10%. If 10% of those fail, test all remaining units at the contractor's expense.

3. EXHAUST FANS

The testing requirements apply to the following fans (check all that apply): (x) central restroom, (x) kitchen hood

A. Parties Responsible to Execute Functional Test

1. Controls contractor: operate the controls to activate the equipment, if BAS controlled.
2. CA: to witness, direct and document testing.

B. Integral Components or Related Equipment Being Tested — Prefunctional Checklist ID

1. Exhaust fans — PC-m3

C. Prerequisites The applicable prerequisite checklist items listed in the beginning of Section 15997 shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions / Modes Required To Be Tested, Test Methods and Seasonal Test Requirements

The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Division.

Function / Mode	Test Method Manual, Monitoring, Either or Both[1]	Required Seasonal Test
General 1. Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, unnoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks that it is associated with.	Manual	
In addition to, or as part of (1) above, the following modes or tests are required:		
2. Verify schedules and setpoints to be reasonable and appropriate		
3. Function at fire alarm (off, depressurization, etc.)	Manual	
4. Interlocks to building pressurization control	Manual	
5. Speed controls	Either	
6. Check TAB report record of sound power level tests and space pressures and compare to specifications	Review	
7. Sensor calibration checks on any controlling temperature or pressure sensor	Manual	

[1]Refer to Special Procedures

E. Special Procedures (other equipment to test with, etc.; reference to function ID)
None

F. Required Monitoring
1. All points listed below which are control system monitored points shall be trended by the controls contractor. Other points shall be monitored by the CA using dataloggers. Refer to the Monitoring section at the beginning of Section 15997 for additional monitoring details.

Point	Time Step (min.)	Minimum Time Period of Trend	Hard Copy? (Y/N)	ASCII File? (Y/N)	Function Being Tested
For each fan:					
Do be determined					

Remarks:

G. Acceptance Criteria (referenced by function or mode ID)
1-6. For the conditions, sequences and modes tested, the fans, integral components and related equipment respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

H. Sampling Strategy for Identical Units of the same type and function, but different in size, are considered identical for sampling purposes.
1. Randomly test at least 10% of each group of identical equipment (the 1st sample). In no case test less than three units in each group. If 10% of the units in the first sample fail the functional performance tests, test another 10% of the group (the 2nd sample). If 10%

of the units in the 2nd sample fail, test all remaining units in the whole group, fully at the contractor's expense. This sampling applies to the testing subsections. That is, if calibration is off on more than 10% of the tested piece of equipment, then another sample shall have calibrations checked, but not all other tests need to be done on the second sample.

4. INDOOR AIR CLIMATE CONTROL--MISC. SYSTEMS

At least 10% of all space zones shall be verified to be maintaining proper climate control. Specific test requirements for this may have been identified elsewhere in this specification (e.g., under terminal units). For all areas not specifically specified, otherwise, the following tests shall be conducted.

A. Parties Responsible to Execute Functional Test
   1. Controls contractor: operate the controls and provide trend logs
   2. CA: to witness, direct and document testing.

B. Integral Components or Related Equipment Being Tested
   1. Air, water or steam distribution system
   2. Control system

C. Prerequisites All listed systems in Part B, above, shall have had successful functional tests completed prior to this test.

D. Functions / Modes Required To Be Tested, Test Methods and Seasonal Test Requirements

This is a performance test to verify that the HVAC systems can provide and maintain the temperature and relative humidity levels specified, during normal and extreme weather and occupancy conditions. The test consists of monitoring, via trend logs, of various points during the cooling season when temperatures reach to within 5°F of season design (ASHRAE 2 1/2%).

E. Special Procedures (other equipment to test with, etc.; reference to function ID)
   1. Building should be normally occupied during the test.

F. Required Monitoring
   1. All points listed below which are control system monitored points shall be trended by the controls contractor. Refer to the Monitoring section at the beginning of Section 15997 for additional monitoring details.

Point	Time Step (min.)	Minimum Time Period of Trend	Hard Copy? (Y/N)	ASCII File? (Y/N)	Function Being Tested
Space temperature control:					
Space temperature	5	5 days incl. weekend	Y	Y	1-3
OSAT-DB	5	5 days incl. weekend	Y	Y	1-3

Remarks:

G. Acceptance Criteria (referenced by function or mode ID)
   1. Space temperature during occupied modes shall average within +/- 1°F of setpoint and always remain within 1°F of the ends of the deadband without excessive hunting of either the applicable damper or coil valve, or complaints of drafts or stuffiness from occupants.

H. Sampling Strategy for Identical Units of the same type and function, but different in size, are considered identical for sampling purposes.
   1. Randomly test at least 10% of each group of identical equipment (the 1st sample). In no case test less than three units in each group. If 10% of the units in the first sample fail the functional performance tests, test another 10% of the group (the 2nd sample). If 10% of the units in the 2nd sample fail, test all remaining units in the whole group, fully at the contractor's expense. This sampling applies to the testing subsections. That is, if calibration is off on more than 10% of the tested piece of equipment, then another sample shall have calibrations checked, but not all other tests need to be done on the second sample.

5. INDOOR AIR QUALITY CHECK (IAQ)

IAQ checking activities are not technically "functional testing." However, they are included here for consistency. Indoor air quality (IAQ) commissioning does not ensure that indoor air quality will be adequate or without deficiency at building turnover or during occupancy, unless the owner has specifically specified that actual air quality testing be performed. Commissioning for indoor air quality entails performing tasks that minimize the potential for IAQ problems, but it does not eliminate their possibility. The primary source for this checklist was Annex C in *ASHRAE Guideline 1-1989R The HVAC Commissioning Process,* Public Review Draft, 1996.

A. Parties Responsible to Perform IAQ Checks
   1. CA: performs and oversees checks, inspections and reviews.
   2. TAB contractor: performs checks using test instruments for tasks under Part C

C. Prerequisites CA will perform each check and review as soon as the materials or work is such that IAQ related determinations can be made.

D. Purpose. The purpose of the IAQ check is to minimize the potential for IAQ problems in the facility during occupancy. The CA is not responsible for any IAQ issues during construction, nor for IAQ issues in the occupied part of the facility, if construction is being performed in other parts of the facility.

E. The following tasks will be conducted and documented:

1. Submittal Reviews

   Compare specified data with submitted data sheets for the following:

   a. Filtration and filter type.
   b. Materials that had specifications for emissions rates as part of the contract documents.
   c. HVAC materials that have a potential for airflow erosion, corrosion and microbial contamination (HVAC insulation materials, etc.).
   d. Manufacturer's safety data sheets (MSDS) for products specified in the contract documents that may be suspected contributors to indoor pollutants (carpets, flooring, fabrics, adhesives, wall coverings, partitions, and ceilings; insulating and fire-proofing materials; sealants on walls and floors; use of preservatives, paints, varnishes, and other finish materials).

2. Static Inspections and Checks
   a. Review the code compliance calculations for accuracy.

b. Verify that the outdoor air intakes are sized and located according the plans and specifications.

c. Verify that no outside conditions exist that could compromise the quality of the air entering the outdoor intakes.

d. Inspect air intakes and exhausts for short-circuiting.

e. Document any required ductwork cleaning.

f. Prior to building turnover, verify that final filters are installed and coils, inside of units and ductwork is clean.

g. Inspect air supply system components to ensure control and minimization of the presence of free and standing water and to minimize microbial contamination (condensate trays, traps, humidifiers, water baffles, mist eliminators and cooling towers).

h. Verify proper access for cleaning of both sides of coils, condensate pans and/or humidifier reservoirs in all HVAC equipment.

i. Meet with contractors and review any specified manufacturer's recommended curing, drying and airing procedures (for minimizing emission rates). Document the compliance of the contractors.

j. When the building is partially occupied during construction, meet with the Contractor and issue a plan in writing for operation of the HVAC system. The plan will describe how the system can be operated at as close to normal operating conditions as possible, to minimize dust and dirt from contaminating the ductwork and coils and polluting the occupied areas, and to prevent damaging moisture migration.

k. Review TAB reports for consistency with the specifications.

l. After completion of TAB, review with the TAB contractor, any areas they may consider as being potentially problematic regarding maintaining adequate minimum outdoor air, proper exhaust or room pressure differential.

3. Air Flow and Pressurization Checks

a. Verify that the specified minimum ventilation rates are maintained during all occupied modes of operation, particularly during VVT terminal box turn-down.

b. Spot-check TAB supply air flow readings in critical areas.

c. Spot-check the TAB measurements and setup of the exhaust systems for each area. When purging is specified in the contract documents, develop a plan for, and see that the Contractor purges the building prior to occupancy.

d. Verify that the total building pressurization criteria is met through varying HVAC loads and economizing conditions.

e. Verify that room pressure differentials are as specified between critical areas (clean rooms, bio-hazards, film developing rooms, chemical storage areas, etc.).

f. Verify that the design engineer's specification for interstitial and area pressurization differentials has been met.

4. Verification

a. Verify that the specified ventilation effectiveness throughout the various areas of the building is being met by: (x) smoke tube testing for airflow patterns, (x) flow hood readings, and ___air contaminant monitoring.

b. Perform IAQ testing using the following methods (surface cultures for microbial

contamination, airborne culture testing, CO_2 monitoring, VOC monitoring, CO monitoring, etc.).

I. Acceptance Criteria
Unless noted in the requirements, the commissioning agent in concert with the CM will make determinations and interpretations for when IAQ issues are considered to be in compliance with the contract documents.

6. HEAT PUMP UNITS

A. Parties Responsible to Execute Functional Test
1. Controls contractor: operate the controls to activate the equipment.
2. CA: to witness, direct and document testing.

B. Integral Components or Related Equipment Being Tested — Prefunctional Checklist ID
1. Unit (fans, coils, condenser, compressors, ducts, VFD) — PC-m4
2. Heat recovery coil , humidifier or direct / indirect evaporative cooling sections — PC-m5

C. Prerequisites The applicable prerequisite checklist items listed in the beginning of Section 15997 shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions / Modes Required To Be Tested, Test Methods and Seasonal Test Requirements
The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Division.

Function / Mode	Test Method Manual, Monitoring, Either or Both[3]	Required Seasonal Test[1]
General 1. Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks that it is associated with.	Manual	
In addition to, or as part of (1) above, the following modes or tests are required:		
2. Mixed and supply air, and reset temp. control functions	Both	
3. Economizer functions	Both	Cooling
4. SF, RF and exhaust fan interlocks	Either	
5. Compressor unloading & condenser fan staging for head pressure control	Both	
6. Demand limiting control (if applicable)	Monitoring	Cooling
7. Duct static pressure (SP) control	Both	
8. Return or exhaust fan tracking and building SP	Monitoring	
9. VFD (or inlet vanes) operation on SF and RF: modulation to	Both	[2]

	Function / Mode	Test Method Manual, Monitoring, Either or Both[3]	Required Seasonal Test[1]
	minimum, control system PID, proportional band of speed vs controlling parameter, constancy of static pressure, verification of program settings, alarms, etc		
10.	Damper interlocks and correct modulation in all modes, including fire and smoke dampers	Manual	
11.	Temperature difference across heating and cooling coils, if spec'd	Manual	
12.	Verification of minimum OSA quantity and control through varying VVT box positions	Either	[2]
13.	Branch duct control damper control	Manual	
14.	Night low and high limit, morning warmup cycle,	Either	
15.	Heat recovery operation	Monitoring	
16.	Verify TAB reported SF cfm with control system reading	Manual	[2]
17.	All alarms (low limits, high static, freezestat, etc.)	Manual	
18.	Unit heating and cooling capacity tests, optional	Manual	Design
19.	Heating and cooling EER or COP efficiency tests, optional		Design
20.	Change over function from heating to cooling and defrost (heatpumps)	Manual	
21.	Sensor and actuator calibration checks on: duct static pressure sensor on units >10 tons, SAT, MAT, OSAT, economizer and RA dampers and other random checks (EMS readout against hand-held calibrated instrument must be within 0.5°F for temps. or within a tolerance equal to 10% of static pressure setpoint, with an inclined manometer)	Manual	
22.	Verify control strategies, schedules and setpoints to be reasonable and appropriate		

[1]Cooling season, Heating season or Both. "Design" means within 5°of season design (ASHRAE 2 1/2%), or 95% of loading design. A blank cell denotes no special seasonal test is required and that test can be executed during any season, if condition simulation is appropriate.
[2]Seasonal test not required if seasonal conditions can be adequately simulated.
[3]Refer to Special Procedures

E. Special Procedures (other equipment to test with, etc.; reference to function ID)
1. Reduced Testing for Smaller Units. For standard application AHU's less than 15 tons, the following modifications to the testing requirements apply: 1) either Manual or Monitoring will satisfy the verification requirement--where Both is listed, choose one. 2) Testing Modes 6, 8, 11, 13 and 16 is not required.

F. Required Monitoring
1. All points listed below which are control system monitored points shall be trended by the controls contractor. Other points shall be monitored by the CA using dataloggers. Refer to the Monitoring section at the beginning of Section 15997 for additional monitoring details.

`

Point	Time Step (min.)	Minimum Time Period of Trend	Hard Copy? (Y/N)	ASCII File? (Y/N)	Function Being Tested
For each Unit being tested:					
RAT	5	5 days incl. weekend	Y	Y	1-3, 5, 19
SAT	5	5 days incl. weekend	Y	Y	1-3, 5
CC LAT	5	5 days incl. weekend	Y	Y	1-3, 5
HC LAT	5	5 days incl. weekend	Y	Y	1-3, 5
MAT	5	5 days incl. weekend	Y	Y	1, 3, 19
Indoor WB or enthalpy	5	5 days incl. weekend	Y	Y	1, 3
SF speed	5	5 days incl. weekend	Y	Y	1, 5-9
RF speed	5	5 days incl. weekend	Y	Y	1, 5-9
Duct SP	5	5 days incl. weekend	Y	Y	1, 7, 9
Building SP differential	5	5 days incl. weekend	Y	Y	8
OSAT	5	5 days incl. weekend	Y	Y	All
OSAT-WB or enthalpy	5	5 days incl. weekend	Y	Y	1, 3
Indoor dry-bulb ___zones	5	5 days incl. weekend	Y	Y	All
Compressor amps or stage	5	5 days incl. weekend	Y	Y	5
Condenser fan amps or stage	5	5 days incl. weekend	Y	Y	5

Remarks:

G. Acceptance Criteria (referenced by function or mode ID)

1-22. For the conditions, sequences and modes tested, the system, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

2. RTU shall be able to maintain the SA temperature within 1.0F either side of the deadband of the current setpoint without excessive hunting.

7. RTU and controls shall control the duct static pressure so that it does not drift more than an amount equal to 10% of the setpoint value either side of the deadband without excessive hunting.

H. Sampling Strategy for Identical Units

1. All identical AHU's over 15 tons shall not have any sampling--test all units. However, 25% of the units may have monitoring be the verification method for modes listed with Monitoring or Both as testing methods, with no less than three units being fully tested per the above requirements.
2. All identical AHU's equal to or less than 15 tons shall be sampled: Randomly test at least 50% of each group of identical equipment (the 1st sample) per the above tests. In no case test less than three units in each group. If 20% of the units in the first sample fail the functional performance tests, test another the remaining 50%, fully at the contractor's expense. This sampling applies to the testing subsections. That is, if calibration is off on more than 10% of the tested piece of equipment, then another sample shall have calibrations checked, but not all other tests need to be done on the second sample.
3. All units not included in the sampling testing and monitoring shall be fully monitored for the monitoring modes listed above in the monitoring section.

7. SERVICE HOT WATER SYSTEM

A. Parties Responsible to Execute Functional Test
1. CA: perform and document testing.

B. Integral Components or Related Equipment Being Tested — Prefunctional Checklist ID
1. Hot water heaters (heaters, mixing valves) — PC-m6

C. Prerequisites The applicable prerequisite checklist items listed in the beginning of Section 15997 shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions / Modes Required To Be Tested, Test Methods and Seasonal Test Requirements
The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Division.

Function / Mode	Test Method Manual, Monitoring, Either or Both	Required Seasonal Test
General 1. Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, unnoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks that it is associated with.	Manual	
In addition to, or as part of (1) above, the following modes or tests are required:		
2. Verify schedules and setpoints to be reasonable and appropriate		
3. Unoccupied pump operation	Either	
4. Mixing valve operation and temperature control	Either	
5. Sensor calibration checks on hot water temperature	Manual	

E. Special Procedures (other equipment to test with, etc.; reference to function ID)
None

F. Required Monitoring
None

G. Acceptance Criteria (referenced by function or mode ID)
1-6. For the conditions, sequences and modes tested, the fan's integral components and related equipment respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

H. Sampling Strategy for Identical Units
1. No sampling. Test all units.

8. **TERMINAL UNITS (VVT)**

(This applies to standard applications, critical applications will have additional tests and a higher fraction tested.)

A. Parties Responsible to Execute Functional Test

1. Controls contractor: operate the controls to activate the equipment.

B. Integral Components or Related Equipment Being Tested — Prefunctional Checklist ID

1. Terminal unit (VVT) — PC-m8

C. Prerequisites The applicable prerequisite checklist items listed in the beginning of Section 15997 shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Functions / Modes Required To Be Tested, Test Methods and Seasonal Test Requirements The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Division.

Function / Mode	Test Method Manual, Monitoring, Either or Both[3]	Required Seasonal Test[1]
General 1. Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, warmup, shutdown, unnoccupied & manual modes and power failure and restoration. Test functionality of this piece of equipment or system in all control strategies or interlocks that it is associated with, including all damper, valve and fan functions.	Manual	
In addition to, or as part of (1) above, the following modes or tests are required:		
2. Sensor activator calibration checks on: SAT, MAT, zone air temperature damper position and other random checks (EMS readout against visual or hand-held calibrated instrument must be within 0.5°F for temps. or within a tolerance equal to 10% of static pressure setpoint, with an inclined manometer)	Manual	
3. Device and actuator calibration and stroke checks for heating coil valve and non-DDC dampers	Manual	
4. For the VVT's tested, check the prefunctional checklist items.	Observation	
5. Verify control parameters and setpoints to be reasonable and appropriate by reviewing the full program of 5% of all the VVT's with each other for consistency. Verify the max. and min. cfm setpoints of all tested VVT's against the control drawing and TAB values. Verify other VVT programming parameters such as K-factors, deadbands, setpoints, stroke times, etc.	Observation	
6. Verify no CCV flow when there is HCV flow	Either	
7. Verify no hunting or significant overshoot by damper or valves.	Either	
8. Verify by measurement, CCV & HCV positive shutoff (no leak-thru)	Manual	
9. Verification of minimum OSA control through varying VAV box	Either	[2]

	Function / Mode	Test Method Manual, Monitoring, Either or Both[3]	Required Seasonal Test[1]
	positions, if applicable		
10.	All alarms (fan status, low limits, high static, etc.)	Manual	
11.	Verify that VVT is maintaining space setpoint temperatures	Monitoring	Both Design
12.	Verify airflows and pressures (this random test is part of the TAB test)	--	

NOTES:

[1]Cooling season, Heating season or Both. "Design" means within 5°F of season design (ASHRAE 2 1/2%), or 95% of loading design. A blank cell denotes no special seasonal test is required and that test can be executed during any season, if condition simulation is appropriate.
[2]Seasonal test not required if seasonal conditions can be adequately simulated.
[3]Refer to Special Procedures

E. Special Procedures (other equipment to test with, etc.; reference to function ID)
None

F. Required Monitoring
1. All points listed below which are control system monitored points shall be trended by the controls contractor. Other points shall be monitored by the CA using dataloggers. Refer to the Monitoring section at the beginning of Section 15997 for additional monitoring details.

Point	Time Step (min.)	Minimum Time Period of Trend	Hard Copy? (Y/N)	ASCII File? (Y/N)	Function Being Tested
For each zone thermostat and space sensor and other critical areas, monitor:					
Space temperature	10	3 weekdays, summer design	Y	Y	11
Space temperature	10	3 weekdays, winter design	Y	Y	11
Space temperature	2	8 hours, occupied	Y	Y	7
Heating coil valve	2	8 hours, occupied	Y	Y	7
Damper position or cfm	2	8 hours, occupied	Y	Y	7

Remarks:

G. Acceptance Criteria (referenced by function or mode ID)
1-11. For the conditions, sequences and modes tested, the VVT, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.
10. Space temperature during occupied modes shall average within +/- 1°F of setpoint and always remain within 1°F of the ends of the deadband without excessive hunting of either the damper or coil valve, or complaints of drafts or stuffiness from occupants.

H. Sampling Strategy for Identical Units of the same type and function, but different in size, are considered identical for sampling purposes.
1. Testing. Randomly test at least 10% of each group of identical equipment (the 1st

sample). In no case test less than three units in each group. If 10% of the units in the first sample fail the functional performance tests, test another 10% of the group (the 2nd sample). If 10% of the units in the 2nd sample fail, test all remaining units in the whole group, fully at the contractor's expense. This sampling applies to the testing subsections. That is, if calibration is off on more than 10% of the tested piece of equipment, then another sample shall have calibrations checked, but not all other tests need to be done on the second sample.

2. Monitoring. Ten percent of the total number of zones in the building, chosen by the Owner, shall be monitored. Within this 10%, shall be included a distribution of all air handlers, zones expected to have the greatest heating and cooling demand, perimeter and core zones and zones identified from the commissioning process that have exhibited potential problems.

9. TEST AND BALANCE WORK (TAB)

A. Parties Responsible to Execute Functional Test
1. TAB contractor: perform checks using test instruments.
2. Controls contractor: operate the controls to activate the equipment.
3. CA: to witness, direct and document testing.

B.

Integral Components or Related Equipment Being Tested	Prefunctional Checklist ID
1. TAB water-side	PC-m9
2. TAB air-side	PC-m10

C. Prerequisites The applicable prerequisite checklist items listed in the beginning of Section 15997 shall be listed on each functional test form and checked off prior to functional testing. The commissioning agent will also spot-check misc. items and calibrations on the prefunctional checklists previously completed by the installer, before the beginning of functional testing.

D. Purpose. The purpose of this test is to spot check the TAB work to verify that it was done in accordance with the contract documents and acceptable practice and that the TAB report is accurate.

E. The following tests and checks will be conducted. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in this Division.

Test or Check	Test Method	Required Seasonal Test[3]
1. A random sample of up to 50 % the TAB report data shall be selected for verification (air velocity, air or water flow rate, pressure differential, electrical or sound measurement, etc.). The original TAB contractor will execute the checks, witnessed by the commissioning authority. The TAB contractor will use the same test instruments as used in the original TAB work. A failure[1] of more than 10% of the selected items of a given system[2] shall result in the failure of acceptance of the system TAB report and the TAB contractor shall be responsible to rebalance the system, provide a new system TAB report and repeat random	Demonstration	

	Test or Check	Test Method	Required Seasonal Test[3]
	verifications of the new TAB report. The random testing will include the verification of minimum outdoor air intake flows at minimum, maximum and intermediate total airflow rates for 50% of the air handlers. Other selected data to be verified will be made known upon day of testing.		
2.	Verify that final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked by the TAB Contractor.	Demonstration	
3.	Verification that the air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity. This shall include a review of TAB methods, control setpoints established by TAB and a physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all VVTs taking off downstream of the static pressure sensor, the VVT on the critical leg has its damper 90% or more open.	Demonstration	
4.	Verification that the water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity. This shall include a review of TAB methods, control setpoints established by TAB and a physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90% or more open.	Demonstration	

[1]Failure of an item is defined as follows:

For air flow of supply and return: a deviation of more than 10% of instrument reading

For minimum outside air flow: 20% of instrument reading (30% for reading at intermediate supply flow for inlet vane or VFD OSA compensation system using linear proportional control)

For temperatures: a deviation of more than 1°F

For air and water pressures: a deviation of more than 10% of full scale of test instrument reading

For sound pressures: a deviation of more than 3 decibels. (Variations in background noise must be considered)

[2]Examples of a "system" are: the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system. Systems can be defined smaller if inaccuracies in TAB work within the smaller defined system will have little or no impact on connected systems.

[3]Cooling season, Heating season or Both. "Design" means within 5°of season design (ASHRAE 2 1/2%), or 95% of loading design. A blank cell denotes no special seasonal test is required and that test can be executed during any season, if condition simulation is appropriate.

F. Special Procedures (other equipment to test with, etc.; reference to function ID)
None

G. Required Monitoring
None

I. Acceptance Criteria (referenced by function or mode ID)
Provided in footnote to test table above.

J. Sampling Strategy for Identical Units
Described in test table above.

END OF SECTION 15 997

SECTION 15 998 - PREFUNCTIONAL CHECKLISTS
MECHANICAL and ELECTRICAL

A. GENERAL

This section contains representative Prefunctional Checklists in a form format (PC).

The PC procedures displayed in a form format here are intended to provide the CA with an example of a format and an indication of the rigor of the required prefunctional checklists and documentation for various equipment types. Though they were not developed specifically for this project, they are generally applicable.

The checklists contain items for both Division 15 and 16 contractors to perform. On each checklist, a column is provided that should be filled out by the Contractor assigning responsibility for that line item to a trade.
Those executing the checklists are only responsible to perform items that apply to the specific application at hand. These checklists do not take the place of the manufacturer's recommended checkout and start-up procedures or report. Some checklist procedures may be redundant of some checkout procedures that will be documented on typical factory field checkout sheets. Double documenting is required in those cases.

Refer to Section 17200 for additional requirements regarding prefunctional checklists, startup and initial checkout. Items that do not apply should be noted along with the reasons on the form. If this form is not used for documenting, one of similar rigor and clarity shall be used. Contractors assigned responsibility for sections of the checklist shall be responsible to see that checklist items by their subcontractors are completed and checked off. "Contr." column or abbreviations in brackets to the right of an item refer to the contractor responsible to verify completion of this item. A/E = architect/engineer, All = all contractors, CA = commissioning agent, CC = controls contractor, EC = electrical contractor, GC = general contractor, MC = mechanical contractor, SC = sheet metal contractor, TAB = test and balance contractor.

B. PREFUNCTIONAL CHECKLISTS

The prefunctional checklists referred to in this section are found later in the document under the "Prefunctional Checklists" tab.

The checklists are provided in electronic file format (Word 6.0 for Windows 3.1). The file name is at the bottom of each page. The file name extension "pc__" stands for Prefunctional Checklist and the last digit is the version number. Any MS Excel spreadsheet files are noted with their usual .xls extension.

COMPONENT	ELECTRONIC FILE NAME

Mechanical Equipment (checklists have both mechanical and electrical trade responsibilities)

Air handler unit	ahu.pc_
Calibration procedures (sensors; actuators)	calibdir.pc_
Controls system (BAS)	controls.pc_
Cooling tower	cooltwr.pc_
Exhaust fan	exh_fan.pc_
Fan coil unit	fancoilu.pc_
Heating water piping	hwpipe.pc_
Startup documentation plan template	startpln.c08
TAB	tabplan.pc_
VVT Terminal unit	tu_pc06.xls

C. SUGGESTED NUMBERING KEY FOR COMMISSIONING PROCEDURES

The checklists, functional tests, documentation and training use the following identification numbering: At the beginning of the identification number is a text abbreviation for the following:

Document or Event Abbreviations

DOC= Documentation
PC = Prefunctional Checklist
SP = Startup Plan
SR = Startup Report
FT = Functional Test
R = Review
TR = Training Record

Prefunctional Checklist Numbering Key

FT-0102.3: The first four digits uniquely identify the piece of equipment to the component level. The first 2 digits are the System Type, the second 2 digits are an arbitrary component number (not necessarily the same as the specified ID number). The number after the decimal is the test number. For example, FT-0102.3 = Functional Test 3 of system Type 1, component number 2 (e.g., 0102.3 = Chiller #2, FT #3, because chillers are system Type 1). Other components under chillers are: additional chillers, pumps, valves, piping; VFDs. The component number of 00 means "general" or "all" components, as with the entire system. All tests, procedures, trainings and records should have the same first 4 digits for any given equipment component.

Another example. If there were only 1 TU type, then tests would be numbered FT-0500.1, 0500.2, etc. If there were 2 TU types TUs: FT-0501.1, 0501.2, etc and 0502.1, .2 etc.

An *example* of the number system follows:

0100	Chilled Water System	0200	Boiler System
	0101 Chiller 1		0201 Boiler 1
	0102 Chiller 2		0202 Boiler 2
	0103 Cooling tower 1		0203 Pump HWP-1
	0104 Cooling tower 2		0204 Pump HWP-2
	0105 Pump CHWP-1		0205 HW piping
	0106 Pump CHWP-2		0206 Sensor calibration
	0107 CHW piping		etc.
	0108 CDW piping		
	0109 Sensor calibration		

Numbers for Primary System Types and Components

Components are in parentheses.

01 Hot water system (boilers, hot water pumps, valves, piping)
02 Air handler units (SF, RF, coils, valves, VFD, ducts, dampers)
03 Packaged, AC or HP units (SF, RF, coils, valves, VFD, ducts, dampers, compressors, condensers)
04 VVT Terminal units
05 Service water system
06 Test and balance (TAB)
07 Building automation system (controls)
08 Lighting controls
09 Specialty fans

END OF SECTION 15 998

SECTION 16 010 – ELECTRICAL GENERAL

PART 1 GENERAL

1.1 INTERPRETATION OF SPECIFICATIONS:

A. General provisions and requirements apply throughout. Cross-references or general provisions may be repeated for convenience or emphasis only.

B. Interpret the following as indicated:

1.	"or equal":	"in accordance with the General Conditions", or "an equivalent with respect to style and function".
2.	"approved":	"approved or accepted by Governing Officials or the authorities having jurisdiction".
3.	"provide":	"furnish and install, connect, and test, and contract for the performance of same."
4.	"wiring":	"required conductors or cable and raceway system, including fittings, boxes, connectors, supports, hardware, labeling, and miscellaneous related accessories".
5.	"work":	"materials completely provided," which shall include all activities and services necessary to meet contract requirements, including inspection and replacement as specified of any defective element".
6.	"materials":	"equipment and/or materials".
7.	":":	"shall be/have" Specifications following a colon are criteria which apply to the term preceding the colon.

1.2 SCOPE OF WORK

A. Install electrical work covered by the below specifications and approved drawings. Provide material, labor transportation, tools, supervision, etc., necessary to complete the total electrical job. Items not specifically mentioned herein which are obviously necessary to make a complete working installation shall be provided, including any necessary field engineering and/or detail drawings required. Submit drawings for approval as provided for "Shop Drawings".

B. The work shall consist of, but shall not be limited to, the following systems:

1. Interior and exterior electrical system for lighting, power and secondary service entrance.
2. Empty conduits for telephone and misc. systems.
3. Power connections to equipment specified in specifications and approved drawings.
4. Temporary power as required for the project.
5. Complete fire alarm system.

C. Division 16 will be responsible to carry out the commissioning requirements specified in Section 16995, 17200 and other sections referenced in 17200.

1.3 CODES AND FEES

A. Work shall be done in accordance with the requirements of the National Electrical Code, NFPA #70, 1999 edition and local and state codes and regulations of utility company providing service.

B. Obtain and pay for all permits and inspections required by the building and safety codes, and ordinances, and the rules and regulations of any legal body having jurisdiction.

C. Electrical items covered by this specification shall be UL labeled and listed for the purpose.

1.4 DRAWINGS

A. The drawings indicate the general arrangement of electrical equipment. Review architectural drawings for door swings, cabinets, counters and other built-in equipment; conditions indicated on architectural plans shall govern for this work. Coordinate installation of electrical equipment with the structural and mechanical equipment and access thereto. Coordinate installation of recessed electrical equipment with concealed ductwork and piping, and wall thickness.

B. Do not scale drawings. Dimensions for layout of equipment shall be obtained from architectural an/or mechanical unless specifically indicated on electrical drawings.

C. Discrepancies shown on different drawings, between drawings and specifications or between documents and field conditions shall be promptly brought to the attention of the Architect.

1.5 SHOP DRAWINGS

A. Submit for review by the architect a complete schedule and data of materials and equipment to be incorporated in the work. Submittals shall be supported by descriptive materials, such as catalog sheets, product data sheets, diagrams, performance curves, and charts published by the manufacturer, to show conformance to specification and drawing requirements, model numbers alone will not be acceptable. Data submitted for review shall contain all information required to indicate compliance with equipment specified. Complete electrical characteristics shall be provided for all equipment. Submittals for lighting fixtures shall include photometric data. The architect reserves the right to require sample of any equipment to be submitted for approval.

B. Each individual submittal item for materials and equipment shall be marked to show specification section and paragraph number which pertains to the item.

C. Prior to submitting shop drawings, review the submittal for compliance with the contract documents and place a stamp or other confirmation thereon which states that the submittal complies with contract requirements. Submittals without such verification will be returned without review.

D. All submittals shall be made at one time. Submittals will not be reviewed until all of the submittals listed below have been received. Submittals shall be made for each of the following items:

Lighting Fixtures	Switchboards
Disconnect Switches	Panelboards
Circuit Breakers	Wiring Devices
Timers	Fuses
Fire Alarm System Components	Photocell
Motor Starters	Contactors
Surge Suppressors	
Electrical Room Plans & Elevations	

E. Prepare and submit scaled plan drawings and wall elevations of each electrical room showing all equipment within the room.

1.6 RECORD DRAWINGS

A. At the time of final inspection, provide three (3) sets of complete data on electrical equipment used in the project and as-built drawings reflecting all field changes. This data shall be in bound form and shall include the following items:
1. Test results required by these specifications.
2. Panelboard shop drawings and circuit directories reflecting all field changes.
3. Data sheets indicating electrical characteristics of all devices and equipment.

1.7 ELECTRICAL SERVICES

A. Electrical service shall be as indicated on the drawings.

1.8 SITE UTILITIES

A. Contact the Architect if any discrepancies should appear from the drawings locating the utilities.

1.9 EQUIPMENT CONNECTIONS:

A. Connect equipment requiring electrical connections under this section of these specifications. Where electrical connections to equipment require specific locations, obtain such locations from shop drawings. Do not scale drawings for location of conduit stub-ups or boxes mounted in wall or floor to serve specific equipment, unless dimensioned on approved electrical drawings.

B. Electrical circuits to equipment furnished under other sections of these specifications are based on design loads. If actual equipment furnished has loads other than design loads, electrical circuits and protective devices shall be revised to be compatible with equipment furnished at no additional cost to the owner.

C. Equipment furnished under other divisions of these specifications to be connected under this section of the specifications shall consist of, but not be limited to, the following:

1. Electrical equipment for heating, ventilating and air conditioning systems.

D. Examine other sections of these specifications, where equipment requiring electrical service is specified. Become fully aware of the scope of the work under this section of these specifications requiring electrical service and connections to equipment specified elsewhere.

1.10 MECHANICAL SYSTEMS:

A. Review plumbing and HVAC drawings and Division 15 of these specifications for mechanical equipment requiring electrical service. Provide service to and make connections to all such mechanical equipment requiring electrical service.

B. Examine the nameplate data for equipment actually furnished on the project. If equipment has loads other than those indicated, control equipment and feeders shall be adjusted in size accordingly. Such adjustment shall be subject to the approval of the architect.

1.11 COORDINATION

A. Coordinate electrical activities with other trades so as to avoid delays, interferences, and any unnecessary work.

1.12 GUARANTEE:

A. For guarantee of work under Division 16, refer to the general and special conditions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials or equipment specified by manufacturer's name shall be used, unless approval of other manufacturers is listed in addendum to these specifications. Request for approval of substitute materials shall be submitted in writing to the architect at least ten working days prior to bid openings.

B. Where substitution of materials alters space requirement indicated on the drawings, submit shop drawings indicating proposed layout of space, all equipment to be installed therein, and clearances between equipment.

C. Material shall be new and shall conform to the applicable standard or standards where such have been established for the particular material in question. Publications and standards of the organization listed below are applicable to materials specified herein.
1. American Society for Testing and Materials (ASTM)
2. Underwriters' Lab (UL)
3. National Electrical Manufacturer Association (NEMA)
4. Insulated Cable Engineers Association (ICEA)
5. Institute of Electrical and Electronic Engineers (IEEE)
6. Edison Electric Institute (EEI)
7. National Fire Protection Association (NFPA)
8. American Wood Preservers Association (AWPA)
9. American National Standards Institute (ANSI)

D. Material of the same type shall be the product of one manufacturer.

E. All cost incurred by the acceptance of substitutions shall be borne by the contractor. Proof for substitution shall be by the contractor.

PART 3 EXECUTION

3.1 WORKMANSHIP

A. Work shall be neatly, orderly, and securely installed with conduits, panels, boxes, switches, etc., perpendicular and/or parallel with the principle structural members. Exposed raceways shall be offset where they enter surface mounted equipment. Wiring installed in panels and other enclosures shall be looped and laced and not wadded or bundled.

3.2 TESTS

A. At final inspection, a test will be made and the entire system shall be shown to be in proper working order as per these specifications and the approved drawings.

B. Provide instruments, labor and materials for any essential intermediate and final testing.

C. Equipment covers (i.e., panelboard trims, motor controls, device plates, and junction box covers) shall be removed, as directed, for inspection of internal wiring. All circuits throughout project shall be energized and shall be tested for operation and equipment connections in compliance with contract requirements. Accessible ceiling shall be removed, as directed, for inspection of equipment installed above ceilings.

3.3 IDENTIFICATION

A. Identify each device such as circuit breakers, panelboards, controllers, etc. with enamel or lacquer letters using machine cut stencils with ½" minimum letters, unless otherwise noted.

B. Identify circuits contained within junction boxes on the cover of all junction boxes.

3.4 CLEANING AND PAINTING:

A. Oil, dirt, grease, and other foreign materials shall be removed from all raceways, fittings, boxes, panelboard trims, and cabinets to provide a clean surface for painting. Scratched or marred surfaces of lighting fixtures, panelboard and cabinet trims, switchboard, or other equipment enclosures shall be touched up with paint furnished by the equipment manufacturers specifically for that purpose. Painting in general is specified under other sections of the specifications.

B. Trim covers for flush-mounted panelboards, telephone cabinets, pull boxes, junction boxes and control cabinets shall not be painted unless specifically required by the architect. Where such painting is required, trim covers shall be removed for painting. Under no conditions shall locks, latches or exposed trim clamps be painted.

C. Unless specifically indicated to the contrary, all painting shall be done under the "Painting" section of these specifications.

END OF SECTION

SECTION 16 100 - BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.1 GENERAL

A. Provide complete conduit system including boxes, fittings and supports. Leave empty conduits with fiber polyline pull cord. Conceal conduits except in unfinished spaces such as areas without ceilings. Type MC cable shall be used for wiring concealed in walls serving receptacles and switches. The MC wiring shall be extended from junction boxes mounted above the ceilings.

1.2 RACEWAYS

A. Install conduits per the below requirements:

1. Intermediate Metal Conduit (IMC): ferrous galvanized conduit.
   Comply with Article #345 of the National Electrical Code.

2. Rigid steel conduit: ferrous galvanized conduit.
   Comply with Article #346 of the National Electrical Code.

3. Electrical Metallic Tubing (EMT): ferrous galvanized conduit.
   conduit.
   Comply with Article #348 of the National Electrical Code.

4. Liquid tight flexible metal conduit.
   conduit.
   Comply with Article #351 of the National Electrical Code.

5. Flexible metal conduit.
   conduit.
   Comply with Article #350 of the National Electrical Code.

6. Rigid nonmetallic conduit: Polyvinyl Chloride Schedule 40 (PVC)conduit.
   Comply with Article #346 of the National Electrical Code.

B. Coordinate raceways with the mechanical ductwork and plumbing work installed in the job,

1.3 OUTLETS

A. Location of Outlets: located diagrammatically on the drawings. Refer to the architectural and mechanical plans for the exact location of outlets. Locate outlets so that they will be symmetrical with architectural details. Locate power outlets to serve the equipment. The location of any outlet may be moved ten feet before it has been installed without additional expense to the owner.

1.4 SIGNS

A. Provide identification to the following electrical equipment with permanently attached phenolic plates with 1/4" white engraved lettering on the face of each, attached with two sheet metal screws. Plates must use color code identification. Identification plates also,

shall identify the panel name and branch of the electrical system.

Main switchboard and individual devices installed therein:
Panelboards
Safety Switches and Disconnects
Contactors and Motor Starters
Transfer Switches
Telephone Cabinets
Individually Mounted Circuit Breakers
Relays
Shunt Trip Pushbuttons
Main Service Disconnects

PART 2 PRODUCTS

2.1 CONDUCTORS

A. Conductors: Copper, 600-volt type THHN/THWN insulation except where noted on drawings. Conductors installed where fixtures are used as raceway shall be 90oC Type THHN or XHHN.

B. Branch circuits: minimum #12 AWG solid copper except for motor leads, which shall be a minimum #12 AWG stranded copper, unless otherwise noted on drawings.

C. Color code three phase system branch circuit and feeder conductors: No. 8 AWG and smaller as follows:

1. 208Y/120 volt
   a. Phase A: Black
   b. Phase B: Red
   c. Phase C: Blue
   d. Neutral: White
   e. Ground: Green

D. MC Cable: Copper conductors with THHN insulation, steel armor, green grounding conductor, 600 volt.

2.2 PULLBOXES

A. Pull boxes: code gauge galvanized sheet steel, per Article 370 of the National Electrical Code, for the number, size and position of conduits entering the box, size of box and maximum number of conductors in a box.

2.3 OUTLET BOXES

A. Provide outlet boxes for each lighting fixture and for each device. Boxes shall not be smaller than specifically indicated herein and shall be larger if required by Article 370 of the National Electrical Code for the number and size of conductors installed. Where lighting fixtures are installed in continuous rows, only one outlet box shall be required unless otherwise noted on drawings.

2.4 RECEPTACLES AND WALL SWITCHES

A. Receptacles and wall switches: the type and size indicated on the drawings. Equal by Bryant, Eagle or P & S.

1. Switches shall be 20-amp 120/277-volt specification grade. Number of poles: as indicated on drawings.

2. Duplex outlets shall be 20-amp 125 volt AC 3 wire specification grade straight blade.

3. Single outlets shall be 20-amp 125-volt AC 3 wire specifications grade straight blade.

B. Device plates: one-piece single or multi-gang type selected to match the specific device or combination of devices. Devices flush mounted in exposed masonry construction shall be jumbo type. Device plates for surface mounted devices shall be used with the type of outlet or outlet box in which the device is mounted. Provide devices installed in areas exposed to the weather with a weatherproof device plate. Device plates shall be metal.

C. Finishes: See Architectural Plans for finish of Switch handles, Device faces, and Flush mounted cover plates.

PART 3 EXECUTION

3.1 GENERAL

A. Type MC cable shall be used for all branch circuit wiring in inaccessible areas. EMT steel conduit shall be used for all branch circuit homeruns and feeders.

B. MC cable shall be run from homerun junction boxes to devices, switches, and light fixtures in inaccessible areas.

C. Rigid steel conduit shall be used for raceways run exposed on exterior of building, in slabs on grade, or in poured concrete walls or columns.

D. Non-Metallic Conduit shall be used for raceways run underground and where non-metallic conduit or plastic conduit (PVC) is specified herein or shown on the drawings.

E. All conduit and MC cable shall be run concealed unless otherwise directed or indicated on the drawings. Concealed conduit shall be run in walls and above ceilings.

F. Conduit shall be run below grade or in the slab where indicated.

G. Circuits above accessible ceilings shall be installed in EMT conduit.

H. MC cable shall not be installed above accessible ceilings. MC cable shall not be installed exposed.

3.2 RACEWAYS

A. Install exposed conduits parallel or at right angles to existing walls, ceilings, and structural members. Support exposed conduits at not more than ten-foot intervals and within three feet of outlets, junction boxes, cabinets and fittings. Support individual runs of conduits by

one hole conduit straps. Support groups of conduits on ½" x ½" fourteen gauge channel. Kindorf, Unistrut, or Powers, suspended from structure with 3/8" threaded steel rods with spring steel conduit supporters. Attach rods to structure with swivel type clamps. Support individual runs of exposed conduits attached to structural steel by beam clamps. Where conduits must pass through structural members obtain approval of architect with respect to location and size of hole prior to drilling.

B. Support concealed branch circuit conduits at intervals not exceeding ten feet and within three feet of each outlet, junction box, cabinet or fitting. Attach individual branch circuit conduits to structural steel members with spring steel type conduit clips and to non-metallic structural members with one-hole conduit straps. Where branch circuit conduits must be suspended below structure, support conduits by trapeze type support of exposed conduits. Attach concealed feeder conduits larger than one inch trade diameter above ceiling to structure on intervals not exceeding twelve feet with conduit beam clamps, one hole conduit straps or trapeze type support in accordance with conditions encountered. Do not attach conduits to channels of ceiling suspension system or suspension wires.

C. Attach conduit support device to structure with wood screws on wood, toggle bolts on hollow masonry, lead shield on solid masonry and machine bolts, clamps, or spring steel clips on steel. Nails are not acceptable.

D. Attach rigid conduit to sheet metal enclosures with two bonding type lock nuts and insulated bushing. EMT connectors and couplings shall be steel set screw type and manufactured by Thomas and Betts or Appleton. Connectors shall be of the insulated throat type. Terminate rigid conduit stub ups not attached to enclosure with steel insulated throat, grounding type bushing. Connectors and couplings shall be approved for the purpose.

E. Provide expansion fittings in feeder conduits where conduits pass through building expansion joints. Conduits penetrating rated firewalls or rated fire floors shall be installed with devices to maintain the fire rating of the wall or floor penetrated. Use O.Z. Gedney "Fire-Seal" or approved equal. Contractor shall caulk holes on both sides of smoke walls where conduits penetrate.

F. Support conduit on the roof by clamping to pre-manufactured polyethylene blocks with integral standard strut channel; Erico Pipe Pier.

G. Protect conduits against dirt, plaster, and foreign debris with conduit plugs. Plugs shall remain in place until masonry work is complete.

H. Seal conduits entering buildings from below grade with fiber and insulating electrical putty to prevent entrance of moisture.

I. Use conduit seals where noted on drawings and per Article #300-5 and #300-7 of the National Electrical Code. Crouse-Hinds Type "EYS", Appleton Type "EYF" or O.Z. Gedney Type "EY" or "EYA".

J. Flexible conduit shall comply with the above and below specifications.

1. Use flexible conduit connection to vibrating equipment, electric duct heaters, unit heaters and rotating machinery, and for connection from junction box to corresponding recessed lighting fixture.

2. Flexible liquid-tight conduit connecting motors, duct heaters, unit heaters and other

electrical equipment subject to vibration shall not exceed eighteen inches in length.

3. Flexible metal conduit from outlet box to recessed lighting fixture shall not exceed six feet in length.

4. Flexible conduit used for other than connections to lighting fixtures shall not be less than one-half inch trade size and in no case shall flexible conduit size be less than permitted by the National Electrical Code for the number and size of conductors to be installed therein. Three-eights inch flexible conduit may be used for connection to lighting fixtures providing conduit fill requirements of National Electrical Code are not exceeded.

5. Maintain ground continuity through flexible conduit with green equipment grounding conductor; do not use flexible conduit for ground continuity.

6. When exposed to weather, when specifically indicated, or when installed in areas subject to moisture, flexible conduit shall be liquid-tight type.

7. Connectors for flexible conduit shall be the insulated throat type. When used with liquid type flexible conduit, connectors shall be of the screw-in ground cone type.

3.3 PULL OR JUNCTION BOXES

A. Provide pull boxes where specifically indicated and where required to facilitate the installation of conductors. Install pull boxes exposed only in unfinished spaces, unless otherwise specifically indicated, and install to be fully accessible.

B. Where pull boxes are installed in finished spaces, boxes shall be flush mounted, with trim, hinged door and flush latch and lock to match panel trim for flush mounted electrical panel. Surface mounted boxes shall be Type "FD" with blank covers.

C. Pull boxes required for horizontal feeders containing more than one feeder shall be provided with reinforced flange and removable 12 gauge ½" x ½" galvanized channel for support of conductors. Wood supports within pull boxes are not acceptable.

D. Splices shall not be permitted in pull boxes except when specifically approved in writing by the architect or where specifically shown on the drawings. Where splices are permitted, splices shall be made with splicing sleeves attached to conductors with hydraulic crimping tool. Split bolt connectors are not acceptable for splices within pull boxes.

E. Feeders within pull boxes shall be individually laced with nylon tie straps of the type with enlarged tab to permit identification of each feeder within pull box.

F. Minimum pull or junction box size shall be 4 11/16" square by 2 1/8" deep.

G. Mark on the cover-plate of the junction box the circuit numbers of the circuits in that box. Marking may be made with permanent markers, in legible writing.

3.4 OUTLET BOXES

A. Outlet boxes for surface mounted and pendant mounted lighting fixtures shall be 4" octagon boxes, 1-1/2" deep.

B. Outlet boxes for flush mounted lighting fixtures shall be 4" square boxes 2 1/8" deep, with blank cover installed adjacent to fixture. Box shall be accessible when fixture is removed. Connection to fixture shall be with flexible conduit and fixture wire.

C. Outlet boxes for switches, receptacles and wall mounted junction boxes shall be 4" square boxes 2-1/2" deep with square edge cover. Where only one conduit enters box, 3 ½" deep single gang switch box may be used. Outlet boxes shall be set to within 1/8" of finished wall.

D. Outlet boxes for switches and receptacles in exposed wiring system shall be “FD” boxes with matching device plate.

E. Outlet boxes for individual switches, and receptacles flush mounted in exposed concrete block shall be single gang masonry boxes 3 ½" deep, set to within 1/8" of finished block.

F. Where special purpose device specified requires larger outlet box than specified herein, provide outlet box suitable for specific device. These outlet boxes shall be of the same type as specified herein for the specific installation required.

G. Where low voltage device is to be installed in common outlet box with line voltage device, provide metal barrier within outlet box to establish two separate compartments.

H. Outlet boxes used for support of surface mounted incandescent lighting fixtures shall be provided with fixture stud. Boxes shall be supported by lightweight channel spanning between and attached to main ceiling support member. Attach channel to ceiling support members with galvanized tie wire or nylon tie straps.

I. Outlet boxes shall not be used for support of fluorescent fixtures, boxes shall be used only as junction boxes.

J. Outlet boxes for use with communication, alarm and signal systems are specified with specific systems.

K. Review architectural and interior drawings for areas where outlets occur within specific architectural or structural features and install outlets as shown on architectural drawings, or, if not shown, accurately center and align boxes within the architectural feature or detail.

L. Unless otherwise indicated or specified, switches and receptacles shall be mounted with bottom of device, the distances indicated herein, above the finished floor except where finished walls are exposed concrete block, in which case height shall be adjusted to allow outlet box for device to be mounted at block joint. Review architectural drawings for any device requiring specific location. Mounting heights for devices shall be as follows (unless noted otherwise):

1. Wall Switches: 48"

2. Wall Receptacles: 18"

3. Receptacles above counter tops: 4" above back splash with major axis horizontal

4. Telephone and Computer Outlets: 18"

M. Devices shall be mounted within outlet boxes to allow device plates to be in contact with wall on sides. Devices shall be accurately aligned with major axis of device parallel to adjacent predominate building feature.

N. Wall switches shall be installed on the strike side of doors.

3.5 CONDUCTORS

A. Feeder and branch circuit conductors No. 6 AWG and larger shall be phase identified in each accessible enclosure by 1" wide plastic tape attached to conductors in a readily visible location. Tape colors shall match color requirements specified herein.

B. Branch circuit conductors shall be connected as indicated on the drawings. Common neutrals and ground wires may be pulled in conduits where only opposite phase conductors are run. Conduits shall have a ground wire pulled and shall comply with Article 250 of the National Electrical Code.

C. Conductors within enclosures, i.e., panels, terminal cabinets, control cabinets shall be grouped and laced with nylon tie straps. Conductors within pull boxes shall be grouped and identified with nylon tie straps with circuit identification tag.

D. Splices in conductors shall be made only within junction boxes, wiring troughs and other enclosures as permitted by the National Electrical Code. Do not splice conductors in panelboards, safety switches, or motor control enclosures. Splices in conductors No. 10 AWG or smaller shall be made with Skotchlok insulated spring connectors, Ideal wing nuts, or Ideal steel crimp connectors with wrap-cap insulating caps. Splices in conductors No. 8 AWG and larger shall be made with split bolt connectors taped with No. 88 plastic electrical tape or Ideal Type GP or GT tap connectors and insulating cover unless splices are specifically indicated to be made with crimping sleeve applied to conductors with hydraulic operated crimping tool.

E. Conductors used only for 120-volt control wiring systems shall be minimum No. 14 AWG stranded type MTW 600 volt insulation. Control conductors to be J.I.C. color-coded. Where control conductors terminate on terminal strip, make termination with lug applied to conductor with crimping tool.

F. Maintain phase rotation established at service equipment throughout entire project.

G. Pull Wires: 500# minimum test continuous fiber polyline.

END OF SECTION 16 100

SECTION 16 400 - ELECTRICAL SERVICE AND DISTRIBUTION EQUIPMENT

PART 1 GENERAL

1.1 GENERAL

A. Provide electrical distribution equipment as specified, scheduled or indicated on the approved drawing and these specifications.

PART 2 PRODUCTS

2.1 PANELBOARDS & SWITCHBOARDS

A. Bolt-in circuit breaker type with a rated main breaker or rated main lugs only as noted on drawings. Interrupting capacity as shown on plans. Multiple breaker shall be common trip type only. Provide GFCI (Ground Fault Circuit Interrupter) breakers where indicated. Panels shall be fully rated, no series ratings are acceptable.

B. End and side gutter shall have minimum clearance as required by the NEC. Depth shall be 5 3/4" minimum.

C. Approved manufacturers are: General Electric, Square D, Cutler-Hammer and Siemens - ITE.

D. Main lugs of panels or main circuit breaker shall be UL listed for copper or aluminum conductors. Lugs shall be of the proper range for feeder conductors indicated on the drawings.

E. Panels throughout project shall be keyed alike.

F. Provide circuit breakers with trip rating class and poles as indicated on the drawings. Class indicated is designation according to Federal Specification W-C-375b and indicates the frame size and interrupting rating required. Operation of multiple breakers shall be by single handle; tie handles are not acceptable.

G. Circuit breakers used for the control of discharge lighting shall be designated for the purpose and bear the marking "SWD".

H. All buses shall be copper.

2.2 TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS)

A. TVSS devices shall be mounted within the panelboard enclosure by the panelboard manufacturer. TVSS devices mounted in separate enclosures will not be accepted.

B. The TVSS device provided shall meet or exceed the following single pulse surge current capacity requirements:
   1. Line to Ground 100 Ka
   2. Line to Neutral 100 Ka
   3. Neutral to Ground 100 Ka

2.3 DISCONNECT SWITCHES

A. Provide Heavy Duty type Fusible or Non-Fusible disconnect switches for all motors located out of sight of motor controller and where specifically indicated on the drawings. Disconnect switches shall disconnect all underground conductors. When exposed to weather, enclosure shall be NEMA 3R (Raintight); otherwise, enclosure shall be NEMA-1. Switches shall be installed to be fully accessible in accordance with Article 110-16 of the National Electrical Code.

B. Disconnect switches for single-phase motors shall be horsepower rated, motor switches without overload protection, voltage rating as per motor nameplate voltage or greater.

C. Fusible disconnect switch shall disconnect all ungrounded conductors and shall be supplied with the proper sized fuse clips and fuses. Fuse size over frame size will be noted on drawings. Fuses shall be current limiting low peak dual element Type RK-5 fuses.

D. Disconnect switches shall be Square D, General Electric, Siemens - ITE or Cutler Hammer. All disconnect switches shall be identified in accordance with the "Identification" section of these specifications and Article 110-22 of the National Electrical Code.

2.4 BACKBOARDS

A. Provide backboards for all panels and power distribution equipment and as required by the local inspectors.

B. Backboards: Be made of 3/4" FRP grade plywood, supported by an angle iron frame painted light gray.

PART 3 EXECUTION

3.1 MANUFACTURER'S RECOMMENDATIONS

A. Install electrical distribution equipment in accordance with the manufacturer's recommendations and these specifications.

3.2 PANELBOARDS

A. Identify each circuit protective device with numeral designation, cross referenced with typewritten circuit directory on interior of panel door. Include a copy of each panel directory, reflecting all field changes, in the bound data provided at the time of final inspection.

B. Circuit breakers shall be numbered and connected to panel bus in the following sequence: Circuit 1, Phase A; Circuit 3, Phase B; Circuit 5, Phase C. Where bus diagrams are indicated on the drawings, breakers shall be positioned in panel to conform to diagrams; otherwise, single pole breakers shall occupy top positions in panel with blank spaces in lower positions and two and three pole breakers in between.

C. Conductors within panels shall be grouped and laced with nylon tie straps. Splicing of conductors within panels is not acceptable. Only one conductor shall be installed under terminal of individual circuit breaker.

END OF SECTION 16 40

SECTION 16 450 - GROUNDING

PART 1 GENERAL

1.1 GROUNDING

A. Grounding shall comply with Article 250 of the National Electrical Code, state and local codes, and the requirements of the utility company serving the site.

B. The building electrical system shall be a grounded wye supplemented with equipment grounding systems. Non-current carrying parts of the electrical system i.e., raceways, equipment enclosures and frames, junction and outlet boxes, machine frames and other conductive items in close proximity with electrical circuits, shall be grounded to provide a low impedance path for potential ground faults.

PART 2 PRODUCTS

2.1 MATERIALS

A. Ground rods shall be 3/4" copper weld sectional rods 10'-0" in length. Top of the ground rod shall be twelve (12) inches below finished grade. Connection to the ground rod shall be made by chemical weld process. Resistance to ground shall not exceed twenty-five (25) ohms.

B. Grounding conductor: copper sized in accordance with Articles 250-94 and 250-95 of the National Electrical Code.

PART 3 GROUNDING

3.1 GROUND TEST

A. Upon completion of the ground rod installation, test the system by the “fall of potential” measuring method using a ground resistance test meter and two auxiliary electrodes driven into the earth, interconnected through the meter with the ground rod installation being tested. Placement of the auxiliary electrodes shall be in accordance with operating instructions of the test meter, but in no case shall be placed within the effective resistance area of the system being tested. The effective resistance area shall be considered twice the ground rod length of the ground rod(s) driven. The test shall not be taken within forty-eight (48) hours of rainfall and shall include the data tested and the lowest reading recorded. Test results shall be forwarded, in writing, immediately to the engineer.

3.2 GROUNDING

A. Ground the neutral conductor of the building electrical system to the metal cold water system and to the ground rod system. Make connections with ground clamp. Install conductor in PVC conduit to point of ground connection. Make connection to the metal cold water pipe of the main metal water line entering the building or the first metal portion of the water line within the building. Install jumper around water meter by approved methods.

B. Provide each panelboard with a copper equipment grounding bar brazed or riveted to the

associated enclosures or cabinet and an insulated neutral bar. Braze the related feeder and branch circuit grounding conductors to the grounding bar or connected with pressure connector. The initial panelboard of each separate system served from a system source or dry type transformer shall have an insulated neutral bar interconnected with the grounding bar to establish the system common ground point.

C. Ground motors by drilling and tapping the bottom of the motor junction box and attaching the conductor to the box with a round head bolt used for no other purpose. Conductor attachment shall be through the use of a lug attached to conductor with crimping tool.

D. Install a grounding conductor in power and lighting conduit installations. All circuit grounding conductors shall be sized per Article 250 of the National Electrical Code.

END OF SECTION 16 450

SECTION 16 500 - LIGHTING FIXTURES

PART 1 GENERAL

1.1 GENERAL

A. Select lighting fixtures from those fixtures included in the fixture schedule. Request for fixtures other than those listed in the fixtures schedule must be submitted in writing at least ten working days prior to opening of bids to the architect with copy to engineer.

B. Request for fixture substitution must be accompanied by construction specifications, photometric test data including foot Lambert reading, and complete dimensions. Data for exterior lighting luminaries must also contain isocandle curves and average lumen distribution data.

C. Select fixtures from the fixture schedule not only by catalog number, but also with consideration to mounting, number and types of lamps, and reference notes as contained in the fixture schedule and/or drawings.

D. Lamps shall be provided for fixtures in accordance with fixture schedule and/or manufacturer's recommendations.

E. Plaster frames shall be provided for recessed fixtures as required when installed into gyp ceilings.

F. Verify fixture numbers, before placing order, to assure that fixtures will be furnished with proper frames, fitting, and devices for installation in the ceiling system which is to be installed.

PART 2 PRODUCTS

2.1 BALLASTS

A. Ballasts provided with fixtures shall be ETL-CBM approved, high power factor, with UL label. Ballasts for rapid start lamps shall be Premium Class P. Ballasts for T-8 lamps shall be electronic. Ballasts shall be for the voltage of the circuit to which connected. Ballasts shall be provided for fluorescent and high intensity discharge lamps.

B. Fluorescent fixtures exposed to outside temperatures shall be provided with 0 degree ballasts.

2.2 LAMPS

A. Provide all lamps for lights on this project.

B. Lamps shall be Philips, Sylvania or General Electric.

PART 3 EXECUTION

3.1 GENERAL

A. Install lighting fixtures in accordance with the manufacturer's recommendations, as herein

specified, or as indicted on the drawings.

B. Hang fluorescent fixtures suspended from ceiling joist by means of fixture chain and approved light support supplied by light manufacturer. Two supports are required for each four (4) foot fixture.

C. Surface and wall mounted emergency lights are to be hung as per approved manufacturers methods for each light.

D. Ceiling grids shall not be used for the sole support of recessed, lay-in type fixtures. Each lay-in type, recessed fixture shall be independently supported from the structure by two #10 hanger wires installed on diagonal corners of the fixture.

E. Provide integral test switch as part of the fixture for lighting fixtures with emergency battery units. Do not use remote test switches.

F. Provide U.L. "FR" Label for recessed lighting fixtures mounted in fire rated ceilings. Construct a fire rated enclosure around the fixture housings using fire rated acoustical ceiling tile.

END OF SECTION 16 500

SECTION 16 720 - FIRE ALARM SYSTEM

PART 1 GENERAL

1.1 SCOPE

A. Provide all labor, material, tools, and equipment necessary for and incidental to the installation and testing of a fully supervised manual and automatic addressable fire alarm system as described herein.

B. The fire alarm system shall be the standard design of a single supplier. Components used shall be cross-listed for use with the system as selected by the Owner. Components shall be supplied by the same Manufacturer, compatible with the existing fire alarm system.

1.2 FIRE MARSHALL APPROVAL

A. Prior to submitting shop drawings for the fire alarm system, the contractor shall meet with the local Fire Marshall to review local requirements. Shop drawings shall reflect local requirements and interpretations of codes.

1.3 REFERENCES

A. Fire alarm system and components shall conform to the following:
1. NFPA 70
2. NFPA 72
3. NFPA 72E
4. NFPA 72G
5. NFPA 72H
6. NFPA 241
7. UL 164
8. UL 268

B. Equipment shall be listed as power limited by Underwriters Laboratories, Inc. or approved by Factory Mutual. The fire alarm system in its entirety shall be in compliance with applicable fire and electrical codes. Accessory components as required shall be catalogued by the Manufacturer and UL listed to operate with the Manufacturer's control panel and other fire alarm equipment. Equipment shall be approved prior to installation by the local fire inspection official and by the Local Authority Having Jurisdiction.

1.4 SUBMITTALS

A. Submit the following Shop Drawings and Submittals listed below for review by the Architect. Submittals shall indicate conformance with the hereinbefore listed References, or provide certification of meeting those requirements.
1. Control Panel / Cabinet
2. Peripheral Devices-Initiating
3. Peripheral Devices-Signaling
4. Peripheral Devices-Auxiliary
5. Batteries with Calculations
6. Point-to-point CAD drawings

B. Submit fire alarm equipment supplier qualifications submitted indicating years in business, service policies, warranty definitions, and a list of similar installations. No system shall be

considered unless there is a locally staffed office offering parts and service within a 50 mile radius of the job site.

C. Contractor qualifications shall be supplied indicating years in business and prior experience with installations that include the type of equipment that is to be supplied.

1.5 RELATED WORK SPECIFIED ELSEWHERE

A. Sprinkler water flow and tamper switches shall be furnished and installed by the Sprinkler Contractor, but wired and connected by the Electrical Contractor. The Electrical Contractor shall review the Plumbing and/or Sprinkler documents for requirements.

B. Duct smoke detectors shall be installed by the Mechanical Contractor, but furnished, wired and connected to the fire alarm system by the Electrical Contractor.

PART 2 PRODUCTS

2.1 SYSTEM DESIGN

A. Provide a fully operational and functional addressable fire detection system. The system shall be electrically supervised against opens and grounds on both station and signal wiring. Opens and grounds shall cause a trouble bell to sound at the control panel until manually silenced by the trouble bell silencing switch and shall not cause a false alarm to be sounded. Basic power supply for the system shall be 120 volts AC supplied from the emergency power system. Operation of all system components shall be 25 volts DC furnished by step down transformers and rectifiers within the control panel. The system shall allow for loading or editing special instructions and operation sequences as required. Software operations shall be stored in non-volatile programmable memory. Loss of primary and secondary power shall not erase the instructions stored in memory.

B. The sequence of operation shall be that actuation of any manual or automatic sensors shall cause:
1. All building alarm devices to sound
2. Appropriate zone annunciators to annunciate
3. Operate outputs to release magnetically held smoke doors
4. Operate outputs to signal the elevator recall functions
5 Shut-down of all ventilation equipment

C. Pressing the appropriate acknowledge button shall acknowledge any alarm or trouble condition. After the points have been acknowledged, the LED's shall glow steady and the panel audible signal will be silenced.

D. The System Reset button shall be used to return the system to its normal state after an alarm condition has been remedied. Should the alarm condition continue to exist, the system will remain in an abnormal state.

2.2 CONTROL PANEL

A. Control panel: fully modular type with all necessary control modules for system operation. Cabinet: constructed of code gauge steel with latch and cylinder type lock, semi-recessed mounted.

B. Provide control modules, device alarm modules, signal modules, power supply module, automatic dual-rate battery charger and sealed, rechargeable type, electrolyte battery within the control panel.

2.3 PERIPHERAL DEVICES - INITIATING

A. Manual stations: non-code type, located as shown on the drawings. Stations shall be semi-flush and remain mechanically locked until manually reset. Mount stations with the base at four feet above finished floor and no more than five feet from any door, measured horizontally.

B. Smoke detectors: photoelectric type, operating on the photodiode, light scattering principle, and listed to UL 268. The sensor shall contain a flashing red LED for visual supervision which goes steady in alarm conditions, and a functional test switch. Provide detector bases as required to operate on 24 volts DC and allow complete functioning of the detector with the selected fire alarm system.

C. Detectors in ducts: photoelectric type and listed by UL for duct installation. Duct detectors: with approved duct housing, mounted exterior to the duct, and with perforated sampling tubes extending across the width of the duct. Activation of duct detectors shall cause actuation of the fire alarm control panel in the same manner as other alarm initiating devices and in addition, cause all air handling units to be deactivated. The detector shall operate with a nominal line voltage of 24 volts DC and shall be provided with indicating lamp and test switch.

D. Heat detectors: of the combination rate-of-rise and fixed temperature type. Sensors shall be listed to UL 268 and shall be suitable for ceiling installations. 'The sensor shall contain a flashing red LED for visual supervision which goes steady in alarm conditions. Provide detector bases as required to operate on 24 volts DC and allow complete functioning of the detector with the selected fire alarm system.

2.4 PERIPHERAL DEVICES - SIGNALING

A. Audio/visual devices: combination electronic horn and xenon flash tube strobe indicator. Sound levels: between 96 db and 103 db, and lamps shall produce a candela level per NFPA at a flash rate of one flash per second. The unit: self rimmed and not require trim kit for semi-flush mount. The device: semi-flush mounted on a 4 inch square back box.

B. Visual devices: xenon flash tube strobe indicator. The lamp shall produce a candela level per NFPA at a flash rate of one flash per second. The unit shall be self rimmed and not require trim kit for semi-flush mount.

2.5 PERIPHERAL DEVICES, AUXILIARY

A. Door magnets: wall mounted, semi-flush, electro-magnetic device, 24 volts DC.

2.6 SPARE PARTS

A. Provide each of the following listed devices as spare parts to the Owner:
1. Two of each manual station
2. Four of each visual alarm
3. Four of each audio/visual alarm
4. Two of each smoke detector base

5. Two of each smoke detector head
6. Two of each heat detector
7. Three spare keys to the fire alarm panel

2.7 WIRING

A. Provide in accordance with NEC (Section 70 of NFPA) and Manufacturer's instructions, wiring, raceways, conduit and outlet boxes required for the erection of a complete system as described herein and as shown on the drawings. Install wiring in metallic conduit and of the approved type for fire alarm use. Wire and cable shall be UL listed and a minimum of 18 AWG or as required by local codes and the LAHJ. A consistent color code shall be used throughout and all wires shall be tagged at all junction points between conductors. Final connections between control equipment and the wiring system shall be made under direct supervision of a representative of the Manufacturer. Raceways containing conductors identified as "Fire Protective Alarm System" conductors shall not contain any other conductors and no AC or audio current carrying conductors shall be allowed in the same raceway with the D.C. fire alarm detection and signaling conductors.

PART 3 EXECUTION

3.1 INSTALLATION

A. Tag wires at junction points and at connections to equipment. Wire markers shall be of the taped band type of permanent material and shall be suitable and permanently stamped with the proper identification. The markers shall be attached in a manner that will not permit accidental detachment. Wiring shall test free from opens, grounds, and short circuits. Final connections between equipment and the wiring system shall be made under the supervision of a representative of the Manufacturer.

B. Wiring for the fire alarm system shall be laid out in the most convenient form for this installation, and all such wiring shall be shown on the as-built drawings which are required under this Division of the specifications. As-built drawings shall also clearly indicate any connections and integration with the existing fire alarm system, as required. A wiring diagram shall be mounted inside the door of the fire alarm control panel.

C. Provide two copies of completed instructions covering the operation and maintenance of the installed system, including circuit drawings and wiring diagrams of the system as actually installed, including as-built building alarm wiring. A complete list of part numbers and names, together with the name of the Manufacturer, shall be included in each manual.

D. All equipment shall be held firmly in place. Fastening and supports shall be adequate to support the loads with a safety factor of five.

E. Addressable devices connected to the fire alarm system shall be identified at the control panel by the room numbers/names assigned by the Owner. The room numbers/names shown on the drawings are for reference only.

3.2 TESTS AND REPORTS

A. Final Acceptance
   1. The system will be accepted only after a satisfactory test of the entire system has been accomplished by a factory-trained distributor in the presence of a representative

of the Authority Having Jurisdiction and Owner's Representative.

B. On-Site Services
1. Provide the on-site services of an authorized technical representative of the Manufacturer to supervise all connections and fully test all devices and components of the system as installed. Owner's representative shall be instructed in the proper use and testing of the system.

3.3 WARRANTY

A. Warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of the complete and certified test or from the date of first beneficial use.

B. The Equipment Manufacturer shall make available to the Owner a maintenance contract proposal to provide a minimum of two (2) inspections and tests per year in compliance with NFPA-72H guidelines.

END OF SECTION 16 720

SECTION 16 750 - MISCELLANEOUS SYSTEMS

PART 1 GENERAL

1.1 SCOPE

A. Provide empty conduit systems complete as indicated on the drawings, and for the following:

1. Telephone System
2. Data System
3. Security System

1.2 EMPTY RACEWAY SYSTEMS

A. Provide conduits as noted on the drawings with pull wires for all the above systems.

PART 2 PRODUCTS

2.1 CONDUIT

A. Conduit shall be as specified under Section 16100 – BASIC MATERIALS AND METHODS.

2.2 OUTLET BOXES

A. Outlet boxes shall be as specified under Section 16100 – BASIC MATERALS AND METHODS

2.3 BACKBOARD

A. Backboards shall be U.S. Plywood or approved equal of minimum 3/4 inch thickness, grade A/D minimum, and installed with good side exposed.

PART 3 EXECUTION

3.1 INSTALLATION

A. Conduits shall contain a nylon pull wire.

B. Provide pullboxes with blank cover plate minimum every 100 feet as directed by UGA.

C. The telephone service shall be installed as indicated on the drawings.

D. Permanently and securely install backboards and paint with two coats of gray paint on both sides prior to the installation of any equipment.

E. Provide (1) #6 awg ground wire to each telephone backboard location. The wire shall be connected to the electrical building grounding system.

END OF SECTION 16 750

SECTION 16 973 - SECURITY SYSTEM

PART 1 GENERAL

1.1 SCOPE OF WORK

A. The work provided within this specification includes a complete zoned security alarm system shall be provided in accordance with all codes and regulations.

1.2 SPECIFICATIONS

A, The security panel used for new construction and all renovations shall be a **Networx NX-BE** panel. These specific panels must be used for standardizing and total system integration.

1. The detectors are specified on the drawings. All substitutions shall be approved prior to bid.

2. All wire **shall be** plenum rated **and per the manufacturers recommendations.**

PART 2 INSTALLATION

A. All control equipment (panels, expanders, and power supplies) is to be mounted no higher than six feet and no lower than four feet.

B. All wire to and between **control equipment** is to be run in conduit. (EMT or Rigid)

C. All wire must be concealed when possible and ran in conduit or wire mold when under ceiling tile level **or in an exposed area**.

D. Motion detectors shall be mounted **so that they are not facing windows**.

1, Each detector shall be on a separate zone.

E. All control equipment (panels, expanders, and power supplies) shall be mounted in the same place.

1. All control equipment shall be mounted in metal cans of appropriate size.

F. All wiring to control equipment shall be neatly routed and bundled.

G. Power wire to control's transformer shall be 18/2 **(minimum)** and shall be ran in EMT conduit. Power to transformer shall be on a dedicated circuit.

H. Detectors shall be mounted with no less than two screws.

I. Control equipment boxes and keypad shall be mounted with four screws.

J. Contractor is responsible for running and wiring phone wire to panel via RJ-31X jack and modular interface cord. This phone line MUST be labeled “Secutity Alarm Phone Line”.

K. Detector placement shall be per drawings.

L. Exact detector placement will be noted out on a floor plan drawing, provided by the alarm contractor at completion of installation or close-out.

PART 3 MAINTENANCE

A. The Contractor shall conduct preventive maintenance on all equipment installed under this contract twice per year for a period of two years from date of acceptance. Maintenance will include all of the manufacturers' suggested service, plus exercise each part of the system and control, and test each power supply and battery installed as part of this system. Written reports shall be submitted to the owner's Contract Manager stating the results of the preventive maintenance, corrective measures taken of any defects found and list of items or components replaced. **Pricing for this service shall be submitted along with the installation price but shall be listed as an "Add Alternate".**

B. Service

1. After normal working hours, the Contractor should have service people available to dispatch to the job site.

2. When this emergency service is required, the Contractor should respond to the call for services within four (4) hours after the call is made. Emergency response must be provided without charge during the warranty period.

C. Drawings and Manuals

1. The successful Contractor shall furnish six (6) complete sets of shop drawings for approval within fourteen (14) days of notification of award. The shop drawings must include at a minimum, proposed detector locations and types, keypad location(s), door contact location(s), control panel location(s), expansion module location(s) and one-line wiring diagram.

2. Upon completion of the installations, the Owner shall be furnished with Three (3) sets of "As-Built" drawings for each location within 30 days of completion of the project.

3. One (1) master set and, for each location, one (1) complete set of operating manuals and reference manuals shall be supplied with each piece of equipment at the time of installation.

4. One (1) master set and, for each location, one (1) complete set of service manuals with circuit schematics, parts list, programming procedures, etc., shall be provided.

D. Codes and Regulations

1. The security alarm system as a whole shall comply with all applicable requirements of the current versions (at time of completion) of the National Electrical Code (NEC), the State of Georgia Building Code, all local fire, life safety codes, NFPA, BOCA, and local authorities having jurisdiction. The system should be Underwriter's Laboratories

(UL) listed for access control. All components for which there is a relevant UL listing should be listed for that purpose.

2. All Georgia Life Safety 101 regulations and ADA regulations must be adhered to and applied during the installation of the equipment. It is the sole responsibility of the contractor to research such regulations.

E. At the completion of work, adjust all systems for intended function, circuiting, voltage regulation, efficiency, and leave in perfect operating condition.

1. Test all work covered under this Contract and demonstrate to the Contract Manager that all requirements have been fulfilled. Program controls for configuration data, alarm system capabilities, etc. as required by the Owner.

2. Test all wiring and connections for continuity and ground prior to installing equipment.

F. Label all wiring runs in a permanent manner and documents such labeling on the "As-Built" drawings. Labeling shall include a numeric or alphanumeric identifier specific to each individual cable, and will be machine printed. Hand written labeling is specifically not acceptable.

G. The number of splices in any wire run shall be minimized. All splices shall be made with approved crimp connectors (using the appropriate crimp tool), terminal strip, or by soldering. No twisted connections shall be used. All splices will be located in a splice box or enclosure. The number of splices to meet industry standards.

H. All components will be securely mounted. No contact, sensor, communicator, control, or similar component will be mounted using adhesive products. Screws, locking washers, and bolts will be used as appropriate for the surface involved. All components exposed to public view should be flush mounted, unless specifically approved by the Contract Manager prior to installation.

I. Any surface mounted wiring should be in EMT conduit or metal "wire mold" type surface mount channel. "Wire mold" type channel should be used in all office type environments, and should be color coordinated with the wall color. All wiring will be run concealed wherever possible. Specific approval from the Contract manager is required to surface run any wiring.

END OF SECTION 16 973

SECTION 16 995 - ELECTRICAL SYSTEMS COMMISSIONING

TABLE OF CONTENTS (with selected subheadings)

1.1 Description
1.2 Responsibilities
A. Electrical Contractor
B. Electrical Designer
1.3 Related Work
2.1 Test Equipment
3.1 Submittals
3.2 Startup
3.3 Functional Performance Tests
3.4 Testing Documentation, Non-Conformance and Approvals
3.5 Operation and Maintenance Manuals
3.6 Training of Owner Personnel
3.7 Deferred Testing
3.8 Written Work Products

PART 1 - GENERAL

1.1 DESCRIPTION

A. The purpose of this section is to specify Division 16 responsibilities in the commissioning process which are being directed by the CA. Other electrical systems testing is required under the direction of the CM.

B. The list of commissioned equipment and systems is found in Section 17200.1.7.

C. Commissioning requires the participation of Division 16 to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in Division 17. Division 16 shall be familiar with all parts of Division 17 and the commissioning plan issued by the CA and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

1.2 RESPONSIBILITIES

A. Electrical Contractors. The commissioning responsibilities applicable to the electrical contractor are as follows *(all references apply to commissioned equipment only)*:

Construction and Acceptance Phases

1. Include the cost of commissioning in the contract price, if not yet let.
2. In each purchase order or subcontract written, include requirements for submittal data, O&M data and training.
3. Attend a commissioning scoping meeting and other necessary meetings scheduled by the CA to facilitate the Cx process.
4. Contractors shall provide normal cut sheets and shop drawing submittals to the CA of commissioned equipment.
5. Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of start-up and functional testing procedures.
    a. Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.
    b. The Commissioning Agent may request further documentation necessary for the commissioning process.
    c. This data request may be made prior to normal submittals.
6. Provide a copy of the O&M manuals submittals of commissioned equipment, through normal channels, to the CA for review and approval.
7. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
8. Provide assistance to the CA in preparation of the specific functional performance test procedures specified in Section 16997. Subs shall review test procedures to ensure

feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.

9. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists from the CA. Submit manufacturer's detailed start-up procedures and the full start-up plan and procedures and other requested equipment documentation to CA for review.
10. During the startup and initial checkout process, execute and document the electrical-related portions of the prefucntional checklists provided by the CA for all commissioned equipment.
11. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.
12. Address current A/E punch list items before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.
13. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
14. Perform functional performance testing under the direction of the CA for specified equipment in Section 16997 and 17200. Assist the CA in interpreting the monitoring data, as necessary.
15. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, CM and A/E and retest the equipment.
16. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
17. During construction, maintain as-built red-line drawings for all drawings and final CAD as-builts for contractor-generated coordination drawings. Update after completion of commissioning (excluding deferred testing). Prepare red-line as-built drawings for all drawings and final as-builts for contractor-generated coordination drawings.
18. Provide training of the Owner's operating personnel as specified.
19. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

Warranty Period

1. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
2. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

B. Electrical Designer/Engineer

1. Refer to Section 17200 for the responsiblities of the Electrical Designer/Engineer.

1.3 RELATED WORK

A. Refer to Section 17200, Part 1.5 for a listing of all sections where commissioning requirements are found.

B. Refer to Section 17200 Part 1.4 for systems to be commissioned and section 17200 Part 1.6 and 16997 for functional testing requirements.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Division 16 shall provide all test equipment necessary to fulfill the testing requirements of this Division.

B. Refer to Section 17200 Part 2.1 for additional Division 16 requirements.

PART 3 - EXECUTION

3.1 SUBMITTALS

A. Division 16 shall provide submital documentation relative to commissioning to the CA as requested by the CA. Refer to Section 17200 Part 3.3 for additional Division 16 requirements.

3.2 STARTUP

A. The electrical contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this section and in 17200 Part 3.4. Division 16 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the commissioning agent or Owner.

B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems, or sub-systems at the discretion of the CA and CM. Beginning system testing before full completion, does not relieve the Contractor from fully completing the system, including all prefunctional checklists as soon as possible.

3.3 FUNCTIONAL PERFORMANCE TESTS

A. Refer to Section 17200 Part 1.4 for a list of systems to be commissioned and to Part 3.6 for a description of the process and to Section 16997 for specific details on the required functional performance tests.

3.4 TESTING DOCUMENTATION, NON-CONFORMANCE AND APPROVALS

A. Refer to Section 17200 Part 3.4 for specific details on non-conformance issues relating to prefunctional checklists and tests.

B. Refer to Section 17200 Part 3.7 for issues relating to functional performance tests.

3.5 OPERATIONS AND MAINTENANCE (O&M) MANUALS

A. Division 16 shall compile and prepare documentation for all equipment and systems covered in Division 16 and deliver to the GC for inclusion in the O&M manuals, according to Section 01730.

B. The CA shall receive a copy of the O&M manuals for review.

3.6. TRAINING OF OWNER PERSONNEL

A. The GC shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed. Refer to Section 17200 for additional details.

B. The CA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment. Refer to Section 17200 for additional details.

C. Electrical Contractor. The electrical contractor shall have the following training responsibilities:

1. Provide the CA with a training plan two weeks before the planned training according to the outline described in Section 17200, Part 3.9.
2. Provide designated Owner personnel with comprehensive training in the understanding of the systems and the operation and maintenance of each major piece of commissioned electrical equipment or system.
3. Training shall start with classroom sessions, if necessary, followed by hands on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
6. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
7. Training shall include:
   a. Use the printed installation, operation and maintenance instruction material included in the O&M manuals.
   b. Include a review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
   c. Discuss relevant health and safety issues and concerns.
   d. Discuss warranties and guarantees.
   e. Cover common troubleshooting problems and solutions.
   f. Explain information included in the O&M manuals and the location of all plans and manuals in the facility.
   g. Discuss any peculiarities of equipment installation or operation.
   h. The format and training agenda in *Guidelines for Commissioning HVAC Systems*, ASHRAE, 1989R, 1996 is recommended.
   i. Classroom sessions shall include the use of overhead projections, slides, video and audio taped material as might be appropriate.

8. Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and maintenance of all pieces of equipment.
9. The electrical contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not *controlled* by the central control system.
10. Training shall occur after functional testing is complete, unless approved otherwise by the Project Manager.
11. Duration of Training. The electrical contractor shall provide training on each piece of equipment according to the following schedule.

_____ Fire Alarm System
_____ Lighting Controls
_____ Security System
_____ Telecom and Data

3.7. DEFERRED TESTING

A. Refer to Section 17200, Part 3.10 for requirements of deferred testing.

3.8 WRITTEN WORK PRODUCTS

A. Written work products of Contractors will consist of the startup and initial checkout plan described in Section 17200 and the filled out startup, initial checkout and prefunctional checklists.

END OF SECTION 16 995

SECTION 16 997 - ELECTRICAL TESTING REQUIREMENTS

PART 1 - GENERAL

1.1. INCLUDED SYSTEMS AND EQUIPMENT

A. The following is a list of the equipment and system test requirements included in this section:
1. Lighting sweep controls
2. Daylight dimming controls
3. Emergency power and UPS system
4. General Indoor Light Levels

1.2 DESCRIPTION

A. This section specifies the functional testing requirements for Division 15 systems and equipment. From these requirements, the Commissioning Authority (CA) shall develop step-by-step procedures to be executed by the Subs. The general functional testing process, requirements and testing methods definitions are described in Section 17200. The test requirements for each piece of equipment or system contain the following:

1. The contractors responsible to execute the tests, under the direction of the CA.
2. A list of the integral components being tested.
3. Prefunctional checklists associated with the components.
4. Functions and modes to be tested.
5. Required conditions of the test for each mode.
6. Special procedures.
7. Required methods of testing.
8. Required monitoring.
9. Acceptance criteria.
10. Sampling strategies allowed.

1.3 PREREQUISITES

The following applicable generic prerequisite checklist items are required to be listed on each written functional test form and be completed and checked off by CA prior to functional testing.

__ All related equipment has been started up and start-up reports and prefunctional checklists submitted and approved ready for functional testing:
__ All control system functions for this and all interlocking systems are programmed and operable per contract documents, including final setpoints and schedules with debugging, loop tuning and sensor calibrations completed.

_____ _____
Controls Contractor Signature or Verbal Date

__ All A/E punchlist items for this equipment corrected.
__ These functional test procedures reviewed and approved by installing contractor.
__ Safeties and operating ranges reviewed by the CA.
__ Test requirements and sequences of operation attached.
__ Schedules and setpoints attached.
__ Sufficient clearance around equipment for servicing.
__ Record of all values for pre-test setpoints changed to accommodate testing has been made and a check box provided to verify return to original values (control parameters, limits, delays, lockouts, schedules, etc.).
__ Other miscellaneous checks of the prefunctional checklist and start-up reports completed successfully.

1.4 MONITORING.

a. Monitoring is a method of testing as a stand-alone method or to augment manual testing.

b. All points listed in the required monitoring section of the test requirements which are control system monitored points shall be trended by the controls contractor. Other points shall be monitored by the CA using dataloggers. At the option of the CA, some control system monitoring may be replaced with datalogger monitoring. At the CA's request, the controls contractor shall trend up to 20% more points than listed at no extra charge.

c. Hard copies of monitored data must be in columnar format with time down the left column and at least 4 columns of point values on the same page. Graphical output is a desirable option, if the system can produce it.

PART 2 - PRODUCTS

-- NOT APPLICABLE --

PART 3 - EXECUTION

1. LIGHTING SWEEP CONTROLS

A. Parties Responsible to Execute Functional Test
1. Controls contractor: operate the controls
2. Electrical contractor: assist in testing sequences
3. CA: to witness, direct and document testing.

B. Integral Components or Related Equipment Being Tested — Prefunctional Checklist ID
1. Lighting Sweep Controls — PC-e1

C. Prerequisites The applicable prerequisite checklist items listed in the beginning of Section 16997 shall be listed on each functional test form and checked off prior to functional testing.

D. Functions / Modes Required To Be Tested and Test Methods
The following testing requirements are an addition to and do not replace any testing requirements elsewhere in this Division.

Function / Mode	Test Method Manual (demonstration), Monitoring, Either or Both
MISCELLANEOUS FUNCTIONS	
1. All specified functions and features are set up, debugged and fully operable.	Verbal discussion of features
2. Power failure and battery backup and power-up restart functions.	Demonstration
3. Security and access codes.	Demonstration
4. Verify override duration setting.	Demonstration
5. Scheduling features fully functional and setup, including holidays.	Observation in terminal screens or printouts
6. Date and time setting in central computer and verify that field panels read the same time.	Demonstration

Function / Mode	Test Method Manual (demonstration), Monitoring, Either or Both
SWEEP FUNCTIONS	
7. 50% of the zones with a minimum of 2 zones per controller or relay must be verified by turning on at least 25% of the lights in the zone and witnessing an actual sweep.	Either
OVERRIDE FUNCTIONS	
8. Manual occupant overrides: 25% of the local override switches, with a minimum of 4 switches must be verified by turning the override switches ON after a sweep and seeing the lights turn back on. 100% of the remainder of the switches should be sight verified to be in place.	Either
9. Telephone and keypad overrides: Test the telephone overrides by calling in for 50% of the zones. Test 50% of the keypad overrides.	Either

E. Special Procedures (other equipment to test with, etc.; reference to function ID)
None

F. Required Monitoring
1. None required, though monitoring can substitute for manual testing for all functions. See section 1.4 above.

G. Acceptance Criteria (referenced by function or mode ID)
1-9 For the conditions, sequences and modes tested, the sweep controls, integral components (All) and related equipment respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

H. Sampling Strategy for Identical Units
1. Sample the units per the above table. If 10% of the units in the first sample fail the functional performance tests, test another 10% of the group (the 2nd sample). If 10% of the units in the 2nd sample fail, test all remaining units in the whole group, fully at the contractor's expense.

2. DAYLIGHT DIMMING CONTROLS

A. Parties Responsible to Execute Functional Test
1. Controls contractor: operate the controls
2. Electrical contractor: assist in testing sequences
3. CA: to witness, direct and document testing.

B. Integral Components or Related Equipment Being Tested ID — Prefunctional Checklist
1. Daylight Dimming Controls — PC-e2

C. Prerequisites The applicable prerequisite checklist items listed in the beginning of Section 16997 shall be listed on each functional test form and checked off prior to functional testing.

D. Functions / Modes Required To Be Tested and Test Methods
The following testing requirements are an addition to and do not replace any testing requirements elsewhere in this Division.

Function / Mode	Test Method Manual (demonstration), Monitoring, Either or Both
MISCELLANEOUS FUNCTIONS	
1. All specified functions and features are set up, debugged and fully operable.	Verbal discussion of features
2. Power failure and battery backup and power-up restart functions.	Demonstration
3. Occupant over-ride functions and duration setting.	Demonstration
4. Scheduling features fully functional and setup, including holidays.	Observation in terminal screens or printouts
5. Date and time setting in central computer.	Demonstration
DIMMING FUNCTIONS	
6. Test the sequence of operation for all features and modes.	Manual
7. Test the dimming controls during “live” conditions verifying that amperage changes in light fixtures are proportional to external light changes, and that the light levels at the specified datum points remain within specified limits. Verify this over a broad area for all areas affected. Verify that all, and only, specified light fixtures are dimming.	Either
8. Verify that delays and ramp times are set and functioning so that the speed of change of light fixture output is slow enough to be judged non-bothersome to occupants.	Manual
9. Verify that dimming does not cause lower than specified light levels in adjacent “non-dimmed” spaces.	Manual
10. Verify that the controls and sensors are not easily overridden or disabled by occupants.	Visual inspection
11. Verify that the photo sensor is in an adequate location and is not being affected by direct sunlight or obstructions.	Visual inspection

E. Special Procedures (other equipment to test with, etc.; reference to function ID)
None

F. Required Monitoring
1. None required, though monitoring can substitute for manual testing for most functions. See section 1.4 above.

G. Acceptance Criteria (referenced by function or mode ID)

1-11 (All) For the conditions, sequences and modes tested, the dimming controls, integral components and related equipment respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

H. Sampling Strategy for Identical Units
1. Each photosensor and its controlled zone must be tested (no sampling).

3. GENERAL INDOOR LIGHT LEVELS

This is a performance test to verify that the lighting systems can provide fixed light levels equal to the specifications. Dynamic tests of occupancy sensors and daylight dimming systems are not included in this test.

A. Parties Responsible to Execute Functional Test
1. Commissioning authority
2. Contractor or A/E witness optional

B. Integral Components or Related Equipment Being Tested
none

C. Prerequisites
none

D. Test Conditions
The test shall be performed at night, with lights on in adjacent rooms open to the tested space. Doors from the tested space shall be closed.

E. Special Procedures
1. Space should be normally furnished and wall, floor and ceiling finishes complete.

F. Required Monitoring
none

G. Acceptance Criteria
1. Average light levels in the tested space at the workplane elevation shall not be less than 10% below nor greater than 30% above the specified light level range for the space.

H. Sampling Strategy
At least 10% of all space zones and rooms shall be verified to be realizing proper light levels, chosen by the Owner.

If 10% of the spaces in the first sample fail the functional performance tests, test another 10% of the group (the 2nd sample). If 10% of the spaces in the 2nd sample fail, test all remaining spaces, fully at the contractor's expense.

END OF SECTION 16 997

SECTION 17 200 - COMMISSIONING REQUIREMENTS

TABLE OF CONTENTS

1.1 Description
- A. Commissioning definition
- C. Abbreviations

1.2 Coordination
- A. Commissioning team
- B. Management
- C. Scheduling

1.3 Commissioning Process
- A. Commissioning plan
- B. Commissioning process

1.4 Related Work
- A. Related commissioning sections

1.5 Responsibilities
- A. Overview
- B. All parties
- C. Architect
- D. Mechanical and Electrical Designers
- E. Commissioning authority
- F. Construction Manager–Owner's Representative
- G. Owner's Project Manager
- H. General Contractor
- I. Equipment Suppliers

1.6 Definitions

1.7 Systems to be Commissioned

2.1 Test Equipment

3.1 Meetings

3.2 Reporting

3.3 Submittals

3.4 Startup, Prefunctional Checklists and Initial Checkout
- A. Application
- B. General
- C. Startup Plan
- D. Sensor Calibrations
- E. Execution
- F. Deficiencies and Approvals

3.5 Phased Commissioning

3.6 Functional Performance Testing
D. Objectives and Scope
E. Development of Test Procedures
F. Test Methods
G. Coordination and Scheduling
H. Test Equipment
I. Problem Solving

3.7 Documentation, Non-Conformance and Approval of Tests
A. Documentation
B. Non-Conformance
C. Failure due to Manufacturer Defect
D. Approval

3.8 Operation and Maintenance (O & M) Manuals

A. Standard O&M Manuals
B. Commissioning Record in O&M Manuals

3.9 Training of Owner Personnel

3.10 Deferred Testing

3.11 Written Work Products

PART 1 - GENERAL

1.1 DESCRIPTION

A. Commissioning. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner's operational needs. This is achieved by beginning in the design phase and documenting design intent and continuing through construction, acceptance and the warranty period with actual verification of performance. **The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.**

Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:

1) Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
2) Verify and document proper performance of equipment and systems.
3) Verify that O&M documentation left on site is complete.
4) Verify that the Owner's operating personnel are adequately trained.

B. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

C. Abbreviations. The following are common abbreviations used in the *Specifications* and in the *Commissioning Plan.* Definitions are found in Section 1.6.

A/E-	Architect and design engineers	FT-	Functional performance test
CA-	Commissioning authority	GC-	General contractor (prime)
CC	Controls contractor	MC-	Mechanical contractor
CM-	Construction Manager (the owner's representative)	PC-	Prefunctional checklist
Cx-	Commissioning	PM-	Project manager (of the Owner)
Cx Plan-	Commissioning Plan document	Subs-	Subcontractors to General
EC-	Electrical contractor	TAB-	Test and balance contractor

1.2 COORDINATION

A. Commissioning Team. The members of the commissioning team consist of the Commissioning authority (CA), the Project Manager (PM), the designated representative of the owner's Construction Management firm (CM), the General Contractor (GC or Contractor), the architect and design engineers (particularly the mechanical engineer), the Mechanical Contractor (MC), the Electrical Contractor (EC), the TAB representative, the Controls Contractor (CC), any other installing subcontractors or suppliers of equipment. If known, the Owner's building or plant operator/engineer is also a member of the commissioning team.

B. Management. The CA is hired by the ___CM, ___GC, (x) A/E, ___the Owner directly. The CA directs and coordinates the commissioning activities and the reports to the (x) CM, ___is part of the CM team. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents. The CA's responsibilities are the same regardless of who hired the CA. Refer to Section 17200 Part 1.6 for additional management details. The following organization chart clarifies the roles.

C. Scheduling. The CA will work with the CM and GC according to established protocols to schedule the commissioning activities. The CA will provide sufficient notice to the CM and GC for scheduling commissioning activities. The GC will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

The CA will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. The *Commissioning Plan—Construction Phase* provides a format for this schedule. As construction progresses more detailed schedules are developed by the CA. The Commissioning Plan also provides a format for detailed schedules.

1.3 COMMISSIONING PROCESS

A. Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with a scoping meeting conducted by the CA where the commissioning process is reviewed with the commissioning team members.
2. Additional meetings will be required throughout construction, scheduled by the CA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.
3. Equipment documentation is submitted to the CA during normal submittals, including detailed start-up procedures.
4. The CA works with the Subs in developing startup plans and startup documentation formats, including providing the Subs with prefunctional checklists to be completed, during the startup process.
5. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with prefunctional checklists being completed before functional testing.
6. The Subs, under their own direction, execute and document the prefunctional checklists and perform startup and initial checkout. The CA documents that the checklists and startup were completed according to the approved plans. This may include the CA witnessing start-up of selected equipment.
7. The CA develops specific equipment and system functional performance test procedures. The Subs review the procedures.
8. The procedures are executed by the Subs, under the direction of, and documented by the CA.
9. Items of non-compliance in material, installation or setup are corrected at the Sub's expense and the system retested.
10. The CA reviews the O&M documentation for completeness.
11. Commissioning is completed before Substantial Completion.
12. The CA reviews, pre-approves and coordinates the training provided by the Subs and verifies that is was completed.
13. Deferred testing is conducted, as specified or required.

1.4 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All of the following sections apply to the Work of this section.

00800 Supplementary Conditions	Provides for a penalty if the Functional Completion milestone does not complete commissioning.
01040b Coordination	Introduces commissioning, refers to Division 17 and requires that the GC hire a qualified CA.
01300 Submittals	Alerts all parties that additional detail in submittals may be required and directs to Division 17.
01700 Project Close-out	Defines Substantial Completion and Functional Completion milestones, relative to commissioning.
01730 O&M Data	Alerts all parties that O&M documentation may be more detailed and directs to Division 17.
15010 Mechanical General	Alerts the mechanical contractor to Cx responsibilities in 15995.

15950 Automatic Controls	Lists special requirements and alerts the controls contractor of the special requirements of the control contractor and control system in 15995.
15991 TAB	Alerts the TAB of Cx responsibilities in 15995.
15995 Mechanical Cx	Describes the Cx responsibilities of the mechanical, controls and TAB contractors and the prefunctional testing and startup responsibilities of each. Points to 15997 for functional testing requirements.
15998 Mechanical Prefunctional Checklist	Provides the prefunctional checklists for use on this project, including items for Div. 15 ***and*** Div. 16.
16010 Electrical General	Alerts the electrical contractor of Cx responsibilities in 16995.
16997 Electrical Testing	Describes the specific functional testing requirements for Division 16 equipment in the project.
16998 Electrical Prefunctional Checklist	Points to Section 15998.
17200 Commissioning	Describes the commissioning process, responsibilities common to all parties, responsibilities of the A/E, CA, CM, PM, GC and Suppliers, focusing on the CA. The unique MC, CC, TAB and EC responsibilities are included in Div. 15 and 16.

Alerts all parties that additional detail in submittals may be required and directs to Division 17.

1.5 RESPONSIBILITIES

A. The responsibilities of various parties in the commissioning process are provided in this section. The responsibilities of the mechanical contractor, TAB and controls contractor are in Division 15 and those of the electrical contractor in Division 16 and those of [list other sections where requirements of other divisions are found]. It is noted that the services for the Project Manager, Construction Manager, Architect, HVAC mechanical and electrical designers/engineers, and Commissioning authority are not provided for in this contract. That is, the Contractor is not responsible for providing their services. Their responsibilities are listed here to clarify the commissioning process.

B. All Parties

1. Follow the Commissioning Plan.
2. Attend commissioning scoping meeting and additional meetings, as necessary.

C. Architect (of A/E)

Construction and Acceptance Phase

1. ___Manage the CA contract, ___GC manages the CA contract, (x) CM or the owner manages the CA contract.
2. Attend the commissioning scoping meeting and selected commissioning team meetings.
3. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual preparation, etc., as contracted.
4. Provide any design narrative documentation requested by the CA.
5. Coordinate resolution of system deficiencies identified during commissioning, according to the contract documents.
6. Prepare and submit final as-built design intent documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.

Warranty Period

1. Coordinate resolution of design non-conformance and design deficiencies identified during warranty-period commissioning.

D. Mechanical and Electrical Designers/Engineers (of the A/E)

Construction and Acceptance Phase

1. Perform normal submittal review, construction observation, as-built drawing preparation, etc., as contracted. One site observation should be completed just prior to system startup.
2. Provide any design narrative and sequences documentation requested by the CA. The designers shall assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
3. Attend commissioning scoping meetings and other selected commissioning team meetings.
4. Participate in the resolution of system deficiencies identified during commissioning, according to the contract documents.
5. Prepare and submit the final as-built design intent and operating parameters documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.
6. From the Contractor's red-line drawings, edit and update one-line diagrams developed as part of the design narrative documentation and those provided by the vendor as shop drawings for the chilled and hot water, condenser water, domestic water, steam and condensate systems; supply, return and exhaust air systems and emergency power system.
7. Provide a presentation at one of the training sessions for the Owner's personnel.

Warranty Period

1. Participate in the resolution of non-compliance, non-conformance and design deficiencies identified during commissioning during warranty-period commissioning.

E. Commissioning Authority (CA)

The CA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CA

may assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility resides with the general contractor and the A/E. The primary role of the CA is to develop and coordinate the execution of a testing plan, observe and document performance—that systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The Contractors will provide all tools or the use of tools to start, check-out and functionally test equipment and systems, except for specified testing with portable data-loggers, which shall be supplied and installed by the CA.

Construction and Acceptance Phase

1. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
2. Coordinate the commissioning work and, with the GC and CM, ensure that commissioning activities are being scheduled into the master schedule.
3. Revise, as necessary, the Draft 2, *Commissioning Plan—Construction Phase.*
4. Plan and conduct a commissioning scoping meeting and other commissioning meetings.
5. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
6. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
7. Review and approve normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
8. Write and distribute prefunctional tests and checklists.
9. Develop an enhanced start-up and initial systems checkout plan with Subs.
10. Perform site visits, as necessary, to observe component and system installations. Attends selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
11. Witness all or part of the HVAC piping test and flushing procedure, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owners project manager of any deficiencies in results or procedures.
12. Witness all or part of any ductwork testing and cleaning procedures, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner's project manager of any deficiencies in results or procedures.
13. Approve prefunctional tests and checklist completion by reviewing prefunctional checklist reports and by selected site observation and spot checking.
14. Approve systems startup by reviewing start-up reports and by selected site observation.
15. Review TAB execution plan.
16. Oversee sufficient functional testing of the control system and approve it to be used for TAB, before TAB is executed.
17. Approve air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.
18. With necessary assistance and review from installing contractors, write the functional performance test procedures for equipment and systems. This may include energy management control system trending, stand-alone datalogger monitoring or manual functional testing. Submit to CM for review, and for approval if required.

19. Analyze any functional performance trend logs and monitoring data to verify performance.
20. Coordinate, witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved. Perform actual functional testing without contractors on equipment so specified in Sections 15997 and 16997.
21. Maintain a master deficiency and resolution log and a separate testing record. Provide the CM with written progress reports and test results with recommended actions.
22. Witness performance testing of smoke control systems by others and all other owner contracted tests or tests by manufacturer's personnel over which the CA may not have direct control. Document these tests and include this documentation in Commissioning Record in O&M manuals.
23. Review equipment warranties to ensure that the Owner's responsibilities are clearly defined.
24. Oversee and approve the training of the Owner's operating personnel.
25. Compile and maintain a commissioning record and building systems book(s).
26. Review and approve the preparation of the O&M manuals.
27. Provide a final commissioning report (as described in this section).

Warranty Period

1. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.
2. Return to the site at 10 months into the 12 month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.
3. Optional: Assist in the development of a preventative maintenance plan, a detailed operating plan or an energy and resource management plan or as-built documentation.

F. Construction Manager—Owner's Representative (CM)

Construction and Acceptance Phase

1. Facilitate the coordination of the commissioning work by the CA, and, with the GC and CA, ensure that commissioning activities are being scheduled into the master schedule.
2. Review and approve the final *Commissioning Plan—Construction Phase*.
3. Attend a commissioning scoping meeting and other commissioning team meetings.
4. Perform the normal review of Contractor submittals.
5. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the CA.
6. Review and approve the functional performance test procedures submitted by the CA, prior to testing.
7. When necessary, observe and witness prefunctional checklists, startup and functional testing of selected equipment.
8. Review commissioning progress and deficiency reports.
9. Coordinate the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
10. Sign-off (final approval) on individual commissioning tests as completed and passing. Recommend completion of the commissioning process to the Project Manager.

11. Assist the GC in coordinating the training of owner personnel.

Note: If the CA is hired by the CM or directly by the owner, some or all of the CM tasks for the commissioning process above become the responsibility of the CA, as the need for oversight of the CA is essentially eliminated. Refer to further detail in the CM definition in Section 1.6, except for the coordination of deficiency resolution.

Warranty Period

1. Assist the CA as necessary in the seasonal or deferred testing and deficiency corrections required by the specifications.

G. Owner's Project Manager (PM)

Construction and Acceptance Phase

1. Manage the contract of the A/E and of the GC.
2. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions according to the *Commissioning Plan—Construction Phase.*
3. Provide final approval for the completion of the commissioning work.

Warranty Period

1. Ensure that any seasonal or deferred testing and any deficiency issues are addressed.

H. General Contractor (GC)

Construction and Acceptance Phase

1. Facilitate the coordination of the commissioning work by the CA, and with the GC and CA ensure that commissioning activities are being scheduled into the master schedule.
2. Include the cost of commissioning in the total contract price.
3. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the CA.
4. In each purchase order or subcontract written, include requirements for submittal data, O&M data, commissioning tasks and training.
5. Ensure that all Subs execute their commissioning responsibilities according to the Contract Documents and schedule.
6. A representative shall attend a commissioning scoping meeting and other necessary meetings scheduled by the CA to facilitate the Cx process.
7. Coordinate the training of owner personnel.
8. Prepare O&M manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

Warranty Period

1. Ensure that Subs execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
2. Ensure that Subs correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

I. Equipment Suppliers

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment testing per agreements with Subs.

3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor, except for stand-alone datalogging equipment that may be used by the CA.
4. Through the contractors they supply products to, analyze specified products and verify that the designer has specified the newest most updated equipment reasonable for this project's scope and budget.
5. Provide information requested by CA regarding equipment sequence of operation and testing procedures.
6. Review test procedures for equipment installed by factory representatives.

1.6 DEFINITIONS

Acceptance Phase - phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.

Approval - acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.

Architect / Engineer (A/E) - the prime consultant (architect) and sub-consultants who comprise the design team, generally the HVAC mechanical designer/engineer and the electrical designer/engineer.

Basis of Design - The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the design intent. The basis of design describes the systems, components, conditions and methods chosen to meet the intent. Some reiterating of the design intent may be included.

Commissioning authority (CA) - an independent agent, not otherwise associated with the A/E team members or the Contractor, though he/she may be hired as a subcontractor to them. The CA directs and coordinates the day-to-day commissioning activities. The CA does not take an oversight role like the CM. The CA is part of the Construction Manager (CM) team or shall report directly to the CM.

Commissioning Plan - an overall plan, developed before or after bidding, that provides the structure, schedule and coordination planning for the commissioning process.

Contract Documents - the documents binding on parties involved in the construction of this project (drawings, specifications, change orders, amendments, contracts, *Cx Plan*, etc.).

Contractor - the general contractor or authorized representative.

Control system - the central building energy management control system.

Construction Manager (CM) - a) the Owner's representative in the day-to-day activities of construction. In general, the construction management services contractor (CM) is hired by the owner to assist the government in the overall management of the project including supervising and on-site managing authority over a project's construction. The General Contractor reports to the CM. The CM is the Owner's on-site representative.

b) When the CA is hired by the GC or A/E, the CM referred to in the commissioning process is a member of the CM team (staff or independent contractor) who shall have direct significant mechanical engineering and commissioning experience. That person designated from the CM team is the owner's representative verifying the adequacy of the commissioning process. In this case, the CM will be more involved in the commissioning work and in witnessing portions of the process (selected start-up and functional tests) and reviewing documents (test approvals, etc.) than in the following case.

c) When the CA is hired by the CM (on staff or as a subcontractor), or directly by the Owner, there may not need to be another CM representative reviewing and approving the work of the CA, other than schedule approvals and consultation during problem solving. In that case, references to the CM in these *Specifications* would actually mean the CA, except that CA progress reports would go to the PM rather than the CM.

Datalogging - monitoring flows, currents, status, pressures, etc. of equipment using stand-alone dataloggers separate from the control system.

Deferred Functional Tests - FTs that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.

Deficiency - a condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).

Design Intent - a dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the owner. It is initially the outcome of the programming and conceptual design phases.

Design Narrative or Design Documentation - sections of either the Design Intent or Basis of Design.

Factory Testing - testing of equipment on-site or at the factory by factory personnel with an Owner's representative present.

Functional Performance Test (FT) - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FTs are performed after prefunctional checklists and startup are complete.

General Contractor (GC) - the prime contractor for this project. Generally refers to all the GC's subcontractors as well. Also referred to as the Contractor, in some contexts.

Indirect Indicators - indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed.

Manual Test - using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

Monitoring - the recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.

Non-Compliance - see Deficiency.

Non-Conformance - see Deficiency.

Over-written Value - writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also "Simulated Signal."

Owner-Contracted Tests - tests paid for by the Owner outside the GC's contract and for which the CA does not oversee. These tests will not be repeated during functional tests if properly documented.

Phased Commissioning - commissioning that is completed in phases (by floors, for example) due to the size of the structure or other scheduling issues, in order minimize the total construction time.

Prefunctional Checklist (PC) - a list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CA to the Sub. Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some prefunctional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The word prefunctional refers to before functional testing. Prefunctional checklists augment and are combined with the manufacturer's start-up checklist. Even without a commissioning process, contractors typically perform some, if not many, of the prefunctional checklist items a commissioning authority will recommend. However, few contractors document in writing the execution of these checklist items. Therefore, for most equipment, the contractors execute the checklists on their own. The commissioning authority only requires that the procedures be documented in writing, and does not witness much of the prefunctional checklisting, except for larger or more critical pieces of equipment.

Project Manager (PM) - the contracting and managing authority for the owner over the design and/or construction of the project, a staff position.

Sampling. - functionally testing only a fraction of the total number of identical or near identical pieces of equipment. Refer to Section 17200, Part 3.6, F for details.

Seasonal Performance Tests - FT that are deferred until the system(s) will experience conditions closer to their design conditions.

Simulated Condition - condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

Simulated Signal - disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.

Specifications - the construction specifications of the Contract Documents.

Startup - the initial starting or activating of dynamic equipment, including executing prefunctional checklists.

Subs - the subcontractors to the GC who provide and install building components and systems.

Test Procedures - the step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CA.

Test Requirements - requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements are specified in the Contract Documents (Sections 15997; 16997, etc.).

Trending - monitoring using the building control system.

Vendor - supplier of equipment.

Warranty Period - warranty period for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

1.7 SYSTEMS TO BE COMMISSIONED

A. The following checked systems will be commissioned in this project.

Equipment and System	Functional Test Requirements Specified In:	Equipment and System	Functional Test Requirements Specified In:
HVAC System	15997	**Electrical System**	
(x) Ductwork	15997	(x) Sweep or scheduled lighting controls	16997
(x) Air handlers	15997	(x) Daylight dimming controls	16997
(x) Packaged units (AC and HP)	15997	(x) Lighting occupancy sensors	16997
(x) Terminal (VVT) units (air)	15997	(x) Security system	16997
(x) Specialty fans	15997	(x) Fire and smoke alarm	16997
(x) Testing, Adjusting and Balancing work	15997	(x) Fire protection systems	16997
(x) HVAC control system	15997	(x) Communications system	16997
(x) Fire and smoke dampers	15997		
(x) Indoor air quality[1]	15997	**Other**	
		(x) Service water heaters	15997

[1] Indoor air quality (IAQ) commissioning does not ensure that indoor air quality will be adequate or without deficiency at building turnover or during occupancy, unless the owner has specifically specified that actual air quality testing is performed. Commissioning indoor air quality entails performing tasks that minimize the potential for IAQ problems, but it does not eliminate their possibility.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested. For example, the mechanical contractor of Division 15 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 15, except for equipment specific to and used by TAB in their commissioning responsibilities. Two-way radios shall be provided by the Division Controller.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and left on site, except for stand-alone datalogging equipment that may be used by the CA.

C. Datalogging equipment and software required to test equipment will be provided by the CA, but shall not become the property of the Owner.

D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the *Specifications.* If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

E. Refer to Section 17200, Part 3.6 E for details regarding equipment that may be required to simulate required test conditions.

PART 3 - EXECUTION

3.1 MEETINGS

A. Scoping Meeting. Within ____[60 to 90, depending on bldg size]__ days of commencement of construction, the CA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the CA. Information gathered from this meeting will allow the CA to revise the Draft 2 *Commissioning Plan* to its "final" version, which will also be distributed to all parties.

B. Miscellaneous Meetings. Other meetings will be planned and conducted by the CA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Subs. The CA will plan these meetings and will minimize unnecessary time being spent by Subs. For large projects, these meetings may be held monthly, until the final 3 months of construction when they may be held as frequently as one per week.

3.2 REPORTING

A. The CA will provide regular reports to the CM or PM, depending on the management structure, with increasing frequency as construction and commissioning progresses. Standard forms are provided and referenced in the *Commissioning Plan.*

B. The CA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.

C. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.

D. A final summary report (about four to six pages, not including backup documentation) by the CA will be provided to the CM or PM, focusing on evaluating commissioning process issues and identifying areas where the process could be improved. All acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, etc., will be compiled in appendices and provided with the summary report. Prefunctional checklists, functional tests and monitoring reports will not be part of the final report, but will be stored in the Commissioning Record in the O&M manuals.

3.3 SUBMITTALS

A. The CA will provide appropriate contractors with a specific request for the type of submittal documentation the CA requires to facilitate the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. At minimum, the request will include the manufacturer and model number, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning authority. All documentation requested by the CA will be included by the Subs in their O&M manual contributions.

B. The Commissioning authority will review and approve submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process, to the functional performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures and only secondarily to verify compliance with equipment specifications. The Commissioning authority will notify the CM, PM or A/E as requested, of items missing or areas that are not in conformance with Contract Documents and which require resubmission.

C. The CA may request additional design narrative from the A/E and Controls Contractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.

D. These submittals to the CA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the Contractor, though the CA will review and approve them.

3.4 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

A. The following procedures apply to all equipment to be commissioned, according to Section 1.7, Systems to be Commissioned. Some systems that are not comprised so much of actual dynamic machinery, e.g., electrical system power quality, may have very simplified PCs and startup.

B. General. Prefunctional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. No sampling strategies are used. The prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

C. Start-up and Initial Checkout Plan. The CA shall assist the commissioning team members responsible for startup of any equipment in developing detailed start-up plans for all equipment. The primary role of the CA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for prefunctional checklists and startup are identified in the commissioning scoping meeting and in the checklist forms. Parties responsible for executing functional performance tests are identified in the testing requirements in Sections 15997, and 16997.

1. The CA adapts, if necessary, the representative prefunctional checklists and procedures from Section 15998. These checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution.
2. These checklists and tests are provided by the CA to the Contractor. The Contractor determines which trade is responsible for executing and documenting each of the line item tasks and notes that trade on the form. Each form will have more than one trade responsible for its execution.
3. The subcontractor responsible for the purchase of the equipment develops the full start-up plan by combining (or adding to) the CA's checklists with the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or

lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.

The full start-up plan could consist of something as simple as:

a. The CA's prefunctional checklists.

b. The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.

c. The manufacturer's normally used field checkout sheets.

4. The subcontractor submits the full startup plan to the CA for review and approval.
5. The CA reviews and approves the procedures and the format for documenting them, noting any procedures that need to be added.
6. The full start-up procedures and the approval form may be provided to the CM for review and approval, depending on management protocol.

OPTION FOR C. 3 - 5 ABOVE:

a. The CA, (instead of the contractor), copies the manufacturer's startup and initial checkout procedures from O&M submittals.
b. The CA marks the applicable areas in the procedures and makes initial and date lines at each procedure or section.
c. The CA transmits these procedures and the original prefunctional checklist procedures (see 1 above) to the Contractor as the startup and initial checkout plan.

D. Sensor and Actuator Calibration.

All field-installed temperature, relative humidity, CO, CO_2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described below. Alternate methods may be used, if approved by the Owner before-hand. All test instruments shall have had a certified calibration within the last 12 months. Sensors installed *in* the unit at the factory with calibration certification provided need not be field calibrated.

All procedures used shall be fully documented on the prefunctional checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.

Sensor Calibration Methods

All Sensors. Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable, are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2°F of each other for temperature and within a tolerance equal to 2% of the reading, of each other, for pressure. Tolerances for critical applications may be tighter.

Sensors Without Transmitters--Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.

Sensors With Transmitters--Standard Application. Disconnect sensor. Connect a signal generator in place of sensor. Connect ammeter in series between transmitter and BAS control panel. Using manufacturer's resistance-temperature data, simulate minimum desired temperature. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the BAS. Record all values and recalibrate controller as necessary to conform with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction. Reconnect sensor. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, replace sensor and repeat. For pressure sensors, perform a similar process with a suitable signal generator.

Critical Applications. For critical applications (process, manufacturing, etc.) more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

Tolerances, Standard Applications

Sensor	Required Tolerance (+/-)	Sensor	Required Tolerance (+/-)
Cooling coil, chilled and condenser water temps	0.4F	Flow rates, water	4% of design
AHU wet bulb or dew point	2.0F	Relative humidity	4% of design
Hot water coil and boiler water temp	1.5F	Combustion flue temps	5.0F
Outside air, space air, duct air temps	0.4F	Oxygen or CO_2 monitor	0.1 % pts
Watthour, voltage & amperage	1% of design	CO monitor	0.01 % pts
Pressures, air, water and gas	3% of design	Natural gas and oil flow rate	1% of design
Flow rates, air	10% of design	Steam flow rate	3% of design
		Barometric pressure	0.1 in. of Hg

Valve and Damper Stroke Setup and Check

EMS Readout. For all valve and damper actuator positions checked, verify the actual position against the BAS readout.

Set pumps or fans to normal operating mode. Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is full open and adjust output signal as required. Command valve or damper to a few intermediate positions. If actual valve or damper position doesn't reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

Closure for heating coil valves (NO): Set heating setpoint 20°F above room temperature. Observe valve open. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set heating setpoint to 20°F below room temperature. Observe the valve close. For pneumatics, by override in the EMS, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change. Restore to normal.

Closure for cooling coil valves (NC): Set cooling setpoint 20°F above room temperature. Observe the valve close. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set cooling setpoint to 20°F

below room temperature. Observe valve open. For pneumatics, by override in the EMS, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change. Restore to normal.

E. Execution of Prefunctional Checklists and Startup.

1. Four weeks prior to startup, the Subs and vendors schedule startup and checkout with the CM, GC and CA. The performance of the prefunctional checklists, startup and checkout are directed and executed by the Sub or vendor. When checking off prefunctional checklists, signatures may be required of other Subs for verification of completion of their work.
2. The CA shall observe, at minimum, the procedures for each piece of primary equipment, unless there are multiple units, (in which case a sampling strategy may be used as approved by the CM). In no case will the number of units witnessed be less than four on any one building, nor less than 20% of the total number of identical or very similar units.
3. For lower-level components of equipment, (e.g., VAV boxes, sensors, controllers), the CA shall observe a sampling of the prefunctional and start-up procedures. The sampling procedures are identified in the commissioning plan.
4. The Subs and vendors shall execute startup and provide the CA with a signed and dated copy of the completed start-up and prefunctional tests and checklists.
5. Only individuals that have direct knowledge and witnessed that a line item task on the prefunctional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

F. Deficiencies, Non-Conformance and Approval in Checklists and Startup.

1. The Subs shall clearly list any outstanding items of the initial start-up and prefunctional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CA within two days of test completion.
2. The CA reviews the report and submits either a non-compliance report or an approval form to the Sub or CM. The CA shall work with the Subs and vendors to correct and retest deficiencies or uncompleted items. The CA will involve the CM and others as necessary. The installing Subs or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CA as soon as outstanding items have been corrected and resubmit an updated start-up report and a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CA recommends approval of the execution of the checklists and startup of each system to the CM using a standard form.
3. Items left incomplete, which later cause deficiencies or delays during functional testing may result in backcharges to the responsible party. Refer to Part 3.7 herein for details.

3.5 PHASED COMMISSIONING

A. The project ___will require, (x) will *not* require startup and initial checkout to be executed in phases. This phasing will be planned and scheduled in a coordination meeting of the CA, CM, mechanical, TAB and controls and the GC. Results will be added to the master and commissioning schedule.

3.6 FUNCTIONAL PERFORMANCE TESTING

A. This sub-section applies to all commissioning functional testing for all divisions.

B. The general list of equipment to be commissioned is found in Section 17200, Part 1.4. The specific equipment and modes to be tested are found in Sections 15997, and 16997.

C. The parties responsible to execute each test are listed with each test in Sections 15997, and 16997.

D. Objectives and Scope. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested. Specific modes required in this project are given in Sections 15997, and 16997.

E. Development of Test Procedures. Before test procedures are written, the CA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Using the testing parameters and requirements in Sections 15997, and 16997 the CA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Sub or vendor responsible to execute a test, shall provide limited assistance to the CA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CA shall provide a copy of the test procedures to the Sub(s) who shall review the tests for feasibility, safety, equipment and warranty protection. The CA may submit the tests to the A/E for review, if requested.

The CA shall review owner-contracted, factory testing or required owner acceptance tests which the CA is not responsible to oversee, including documentation format, and shall determine what further testing or format changes may be required to comply with the *Specifications*. Redundancy of testing shall be minimized.

The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.

Representative test formats and examples (not designed for this facility) are found in the appendices to Divisions 15 and 16. The test procedure forms developed by the CA shall include (but not be limited to) the following information:

1. System and equipment or component name(s)
2. Equipment location and ID number
3. Unique test ID number, and reference to unique prefunctional checklist and start-up documentation ID numbers for the piece of equipment
4. Date
5. Project name
6. Participating parties
7. A copy of the specification section describing the test requirements
8. A copy of the specific sequence of operations or other specified parameters being verified

9. Formulas used in any calculations
10. Required pre-test field measurements
11. Instructions for setting up the test.
12. Special cautions, alarm limits, etc.
13. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
14. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
15. A section for comments
16. Signatures and date block for the CA

F. Test Methods.

1. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone dataloggers. Sections 15997, and 16997 specify which methods shall be used for each test. The CA may substitute specified methods or require an additional method to be executed, other than what was specified, with the approval of the CM. This may require a change order and adjustment in charge to the Owner. The CA will determine which method is most appropriate for tests that do not have a method specified.
2. Simulated Conditions. Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
3. Overwritten Values. Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the
value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
4. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
5. Altering Setpoints. Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55F, when the outside air temperature is above 55F, temporarily change the lockout setpoint to be 2F above the current outside air temperature.
6. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification is completed during prefunctional testing.
7. Setup. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Sub executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified

conditions. At completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.

8. Sampling. Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference. The specific recommended sampling rates are specified with each type of equipment in Sections 15997, and 16997. It is noted that no sampling by Subs is allowed in prefunctional checklist execution.

   A common sampling strategy referenced in the *Specifications* as the "xx% Sampling—yy% Failure Rule" is defined by the following example.

   xx = the percent of the group of identical equipment to be included in each sample.
   yy = the percent of the sample that if failing, will require another sample to be tested.

   The example below describes a 20% Sampling—10% Failure Rule.

   a. Randomly test at least 20% (xx) of each group of identical equipment. In no case test less than three units in each group. This 20%, or three, constitute the "first sample."
   b. If 10% (yy) of the units in the first sample fail the functional performance tests, test another 20% of the group (the second sample).
   c. If 10% of the units in the second sample fail, test all remaining units in the whole group.
   d. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CA may stop the testing and require the responsible Sub to perform and document a checkout of the remaining units, prior to continuing with functionally testing the remaining units.

G. Coordination and Scheduling. The Subs shall provide sufficient notice to the CA regarding their completion schedule for the prefunctional checklists and startup of all equipment and systems. The CA will schedule functional tests through the CM, GC and affected Subs. The CA shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.

   In general, functional testing is conducted after prefunctional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

H. Test Equipment. Refer to Section 17200, Part 2 for test equipment requirements.

I. Problem Solving. The CA will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the GC, Subs and A/E.

3.7 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation. The CA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the CM for review and approval and to the Subs for review. The CA will include the filled out forms in the O&M manuals.

B. Non-Conformance.

1. The CA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the CM on a standard non-compliance form.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CA. In such cases the deficiency and resolution will be documented on the procedure form.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the CM.
4. As tests progress and a deficiency is identified, the CA discusses the issue with the executing contractor.
    a. When there is no dispute on the deficiency and the Sub accepts responsibility to correct it:
        1) The CA documents the deficiency and the Sub's response and intentions and they go on to another test or sequence. After the day's work, the CA submits the non-compliance reports to the CM for signature, if required. A copy is provided to the Sub and CA. The Sub corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested and sends it back to the CA.
        2) The CA reschedules the test and the test is repeated.

    b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
        1) The deficiency shall be documented on the non-compliance form with the Sub's response and a copy given to the CM and to the Sub representative assumed to be responsible.
        2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the Project Manager.
        3) The CA documents the resolution process.
        4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CA. The CA reschedules the test and the test is repeated until satisfactory performance is achieved.

5. Cost of Retesting.

    a. The cost for the *Sub* to retest a prefunctional or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the GC.

b. For a deficiency identified, not related to any prefunctional checklist or start-up fault, the following shall apply: The CA and CM will direct the retesting of the equipment once at no "charge" to the GC for their time. However, the CA's and CM's time for a second retest will be charged to the GC, who may choose to recover costs from the responsible Sub.
c. The time for the CA and CM to direct any retesting required because a specific *prefunctional* checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be backcharged to the GC, who may choose to recover costs from the party responsible for executing the faulty prefunctional test.
d. Refer to the sampling section of Section 17200, Part 3.6 for requirements for testing and retesting identical equipment.

6. The Contractor shall respond in writing to the CA and CM at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.
7. The CA retains the original non-conformance forms until the end of the project.
8. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the prime contractor.

C. Failure Due to Manufacturer Defect. If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the CM or PM. In such case, the Contractor shall provide the Owner with the following:

a. Within one week of notification from the CM or PM, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CM or PM within two weeks of the original notice.
b. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
c. The CM or PM will determine whether a replacement of all identical units or a repair is acceptable.
d. Two examples of the proposed solution will be installed by the Contractor and the CM will be allowed to test the installations for up to one week, upon which the CM or PM will decide whether to accept the solution.
e. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

D. Approval. The CA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CA and by the CM, if necessary. The CA recommends acceptance of each test to the CM using a standard form. The CM gives final approval on each test using the same form, providing a signed copy to the CA and the Contractor.

3.8. OPERATION AND MAINTENANCE MANUALS

A. Standard O&M Manuals.

1. The specific content and format requirements for the standard O&M manuals are detailed in Section 01730. Special requirements for the controls contractor and TAB contractor are found Section 15995, Part 3.6.
2. A/E Contribution. The A/E will include in the beginning of the O&M manuals a separate section describing the systems including:

   a. The design intent narrative prepared by the A/E and provided as part of the bid documents, updated to as-built status by the A/E.
   b. Simplified professionally drawn single line system diagrams on 8 ½" x 11" or 11" x 17" sheets. These shall include chillers, water system, condenser water system, heating system, supply air systems, exhaust systems and electrical systems. These shall show major pieces of equipment such as control valves, coils, service valves, etc.

3. CA Review and Approval. Prior to substantial completion, the CA shall review the O&M manuals, documentation and redline as-builds *for systems that were commissioned* to verify compliance with the *Specifications.* The CA will communicate deficiencies in the manuals to the CM, PM or A/E, as requested. Upon a successful review of the corrections, the CA recommends approval and acceptance of these sections of the O&M manuals to the CM, PM or A/E. The CA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E's review of the O&M manuals according to the A/E's contract.

B. Commissioning Record in O&M Manuals.

1. The CA is responsible to compile, organize and index the following commissioning data by equipment into labeled, indexed and tabbed, three-ring binders and deliver it to the GC, to be included with the O&M manuals. Three copies of the manuals will be provided. The format of the manuals shall be:

   Tab I-1 Commissioning Plan
   Tab I-2 Final Commissioning Report (see (B.2) below)
   Tab 01 System Type 1 (chiller system, packaged unit, boiler system, etc.)
   Sub-Tab A Design narrative and criteria, sequences, approvals for Equipment 1
   Sub-Tab B Startup plan and report, approvals, corrections, blank prefunctional checklists
   Colored Separator Sheets—for each equipment type (fans, pumps, chiller, etc.)
   Sub-Tab C Functional tests (completed), trending and analysis, approvals and corrections, training plan, record and approvals, blank functional test forms and a recommended recommissioning schedule.
   Tab 02 System Type 2.....repeat as per System 1

2. Final Report Details. The final commissioning report shall include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope and a general description of testing and verification methods. For each piece of commissioned equipment, the report should contain the disposition of the commissioning authority regarding the adequacy of the equipment,

documentation and training meeting the contract documents in the following areas: 1) Equipment meeting the equipment specifications, 2) Equipment installation, 3) Functional performance and efficiency, 4) Equipment documentation and design intent, and 5) Operator training. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. Each non-compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented. The functional performance and efficiency section for each piece of equipment shall include a brief description of the verification method used (manual testing, BAS trend logs, data loggers, etc.) and include observations and conclusions from the testing.

3. Other documentation will be retained by the CA.

3.9 TRAINING OF OWNER PERSONNEL

A. The GC shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed.

B. The CA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.

1. The CA shall interview the facility manager and lead engineer to determine the special needs and areas where training will be most valuable. The Owner and CA shall decide how rigorous the training should be for each piece of commissioned equipment. The CA shall communicate the results to the Subs and vendors who have training responsibilities.
2. In addition to these general requirements, the specific training requirements of Owner personnel by Subs and vendors is specified in Division 15 and 16.
3. Each Sub and vendor responsible for training will submit a written training plan to the CA for review and approval prior to training. The plan will cover the following elements:
   a. Equipment (included in training)
   b. Intended audience
   c. Location of training
   d. Objectives
   e. Subjects covered (description, duration of discussion, special methods, etc.)
   f. Duration of training on each subject
   g. Instructor for each subject
   h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
   i. Instructor and qualifications
4. For the primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.

5. The CA develops an overall training plan and coordinates and schedules, with the CM and GC, the overall training for the commissioned systems. The CA develops criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The CA recommends approval of the training to the CM using a standard form. The CM also signs the approval form.
6. At one of the training sessions, the CA presents a 1 hour presentation discussing the use of the blank functional test forms for re-commissioning equipment.

7. Video taping of the training sessions will be provided by (x) the Owner, ___ the CA with tapes cataloged by (x) the Owner, ___ the CA and added to the O&M manuals.
8. The mechanical design engineer shall at the first training session present the overall system design concept and the design concept of each equipment section. This presentation shall be 1.5 hours in length and include a review of all systems using the simplified system schematics (one-line drawings) including chilled water systems, condenser water or heat rejection systems, heating systems, fuel oil and gas supply systems, supply air systems, exhaust system and outside air strategies.

3.10 DEFERRED TESTING

A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the PM. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.

B. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) specified in Section 15997 shall be completed as part of this contract. The CA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the CA witnessing. Any final adjustments to the O&M manuals and as-builds due to the testing will be made.

3.11 WRITTEN WORK PRODUCTS

A. The commissioning process generates a number of written work products described in various parts of the *Specifications.* The *Commissioning Plan—Construction Phase,* lists all the formal written work products, describes briefly their contents, who is responsible to create them, their due dates, who receives and approves them and the location of the specification to create them. In summary, the written products are:

Product	Developed By
1. Final commissioning plan	CA
2. Meeting minutes	CA
3. Commissioning schedules	CA with GC and CM
4. Equipment documentation submittals	Subs
5. Sequence clarifications	Subs and A/E as needed
5. Prefunctional checklists	CA (already in Specs)
6. Startup and initial checkout plan	Subs and CA (compilation of existing documents)
7. Startup and initial checkout forms filled out	Subs
8. Final TAB report	TAB
9. Issues log (deficiencies)	CA
10. Commissioning Progress Record	CA
11. Deficiency reports	CA
12. Functional test forms	CA

Product	Developed By
13. Filled out functional tests	CA
14. O&M manuals	Subs
15. Commissioning record book	CA

16.	Overall training plan		CA and CM
17.	Specific training agendas		Subs
18.	Final commissioning report		CA
19.	Misc. approvals	CA	

END OF SECTION 17 200