August 9, 2005

*PRO*JECT SPECIFICATIONS
AND
RELATED ITEMS

For The Construction of

PASCO COUNTY SHERIFF'S STATION/ FIRE STATION NO. 15 TRINITY BOULEVARD PASCO COUNTY, FL

SEI PROJECT NO. 2005-08

Prepared by:

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INDEX TO SPECIFICATIONS

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Divisions-1 specifications sections, apply to this section.

1.02 PROJECT DESCRIPTION FOR SHERIFF'S STATION/ FIRE STATION NO. 15

A. The project consists of a new 5,033 square foot building with a covered/ screen enclosure patio, 222 S.F. , to be the Pasco County Fire Rescue Station facility, joining to a new 3,157 S.F. building with total 629 S.F. of two (2) covered entrances to be the Pasco County Sheriff's station, located on Trinity Boulevard, Pasco County, Florida.

B. The project includes, but is not limited to, new building construction and site improvement. Site improvement includes but is not limited to clearing and grubbing, site grading, soil compaction and installation of walkways, parking lot pavement, site utilities and landscape. New construction includes but is not limited to a pre-engineered structure and standing seam metal roof system, concrete masonry unit, building walls with brick veneer, mechanical system, electrical distribution system, plumbing systems, interior finishes and millwork.

C. The Work of the base bid consists of:

1. All work necessary to construct a new building structures as described above, not noted as an alternate.

PART 2 - PRODUCTS (Not applicable.)

PART 3 - EXECUTION (Not applicable.)

END OF SECTION 01010

SECTION 01019 - CONTRACT CONSIDERATIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Schedule of Values.

B. Application for Payment.

C. Change procedures.

D. Alternates.

1.02 RELATED SECTIONS

A. Section 01300 - Submittals: Schedule of Values.

B. Section 01600 - Material and Equipment: Product substitutions and alternates.

1.03 SCHEDULE OF VALUES

A. Submit typed schedule on AIA Form G702 and G703 - Application and Certificate for Payment Continuation Sheet.

B. Submit Schedule of Values in duplicate within twenty four (24) hours after date of Bid.

C. Format: Utilize the Table of Contents of this Project Manual. Identify each line with number and title of the major specification Section. Identify site mobilization, bonds and insurance.

D. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.

1.04 APPLICATIONS FOR PAYMENT

A. Submit three (3) copies of each application on AIA Form G702 - Application and Certificate for Payment.

B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

C. Payment Period: Fully executed applications for payment shall be submitted to the Owner by the 5th of each month. Owner shall make payment by the 30th of each month or the first business day thereafter. This schedule is subject to adjustment based upon Board of County Commissioners meeting schedules.

1.05 CHANGE PROCEDURES

A. The Architect/Engineer will advise of minor changes in the Work not involving an adjustment to Contract Sum/Price or Contract Time as authorized by issuing supplemental instructions on AIA Form G710.

B. The Architect/Engineer may issue a Proposal Request which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change. Contractor will prepare and submit an estimate within fourteen (14) days.

C. The Contractor may propose changes by submitting a request for change to the Architect/Engineer, describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, and the effect on the Contract Sum/Price and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01600.

D. Stipulated Sum/Price Change Order: Based on Proposal Request and contractor's fixed price quotation or Contractor's request for a Change Order as approved by Architect/Engineer.

E. Unit Price Change Order: For pre-determined unit prices and quantities, the Change Order will be executed on a fixed unit price basis. For unit costs or quantities of units of work which are not pre-determined, execute Work under a Construction Change Directive. Changes in Contract Sum/Price or Contract Time will be computed as specified for Time and Material Change Order.

F. Construction Change Directive: Architect/Engineer may issue a directive, on AIA Form G713 Construction Change Directive signed by the Owner, instructing the contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly

execute the change.

G. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract. Architect/Engineer will determine the change allowable in Contract Sum/Price and contract Time as provided in the Contract Documents.

H. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

I. Change Order Forms: AIA Form G701, Change Order.

J. Execution of Change Orders: Architect/Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

1.06 ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at the Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work as required.

C. See Section 01010 for a schedule of alternates.

END OF SECTION 01019

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Submittal procedures.

B. Substitutions.

C. Construction progress schedules.

D. Proposed products list.

E. Shop drawings.

F. Product data.

G. Samples.

H. Manufacturers' instructions.

I. Manufacturers' certificates.

J. Construction photographs.

1.02 RELATED SECTIONS

A. Section 01600 - Material: Equipment: Request for Substitution Procedures.

B. Section 01700 - Contract Closeout: Contract warranty and manufacturer's certificates closeout submittals.

1.03 SUBMITTAL PROCEDURES

A. Transmit each submittal with Architect/Engineer accepted form.

B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.

C. Identify Project, Contractor, Subcontractor or Supplier; pertinent drawing sheet and

detail number(s), and specification section number, as appropriate.

D. Apply Contractor's stamp, signed or initialled certifying that review, verification of Products required, field dimensions, adjacent construction work and coordination of information, is in accordance with the requirements of the Work and Contract Documents.

E. Schedule submittals to expedite the Project, and deliver to Architect/Engineer at business address. Coordinate submission of related items.

F. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

G. Provide space for Contractor and Architect/Engineer review stamps.

H. Revise and resubmit submittals as required, identify all changes made since previous submittal.

I. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.04 SUBSTITUTIONS

A. The materials, products and equipment described in the bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

B. Requests for substitutions will be considered by the Architect and Owner up until ten (10) calendar days prior to the date for receipt of Bids. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including drawings, cuts, performance and test data and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute would require shall be included. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final. All requests for substitutions shall be sent to the Architect.

C. Notice of all approved substitutions will be set forth in an Addendum. Bidders shall not rely upon approvals that may be made in any other manner.

D. No substitutions will be considered after the Contract award except by written Change Order approved by the Owner and the Office of Facilities Management.

E. See Section 01600 - Material & Equipment for substitution submittal procedure.

1.05 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial progress schedule in duplicate within ten (10) days after date of Owner-Contractor Agreement for Architect/Engineer review. Submit calendar for first month's work prior to beginning any work. Submit complete CPM schedule prior to first pay request (or within 30 days of Owner/Contractor Agreement).

1. No subcontractor is to begin work prior to being approved by the Architect for compliance with these specifications. A complete list of subcontractors and suppliers shall be submitted and approved ten (10) days after date of Owner-Contractor Agreement, complete with required bonds and licenses.

2. Schedule of Values: Schedule of Values required by the Contract Documents shall be submitted for approval by the Architect a minimum of twenty (20) days prior to first payment. The Schedule of Values shall be broken down in a manner to denote costs attributable to each building and other costs for site work and other items aggregating the total contract amount.

3. Record Documents of as-built conditions shall be maintained daily and shall be made available for inspection by the Architect at each pay request meeting.

B. Revise and resubmit as required.

C. Submit revised schedules with each Application for Payment, identifying changes since previous version.

D. Submit computer generated network analysis diagram using the critical path method, generally as outlined in Associated General Contractors of American (AGC) publication, "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry".

E. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.

F. Indicate estimated percentage of completion for each item of Work at each

submission.

G. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and under Allowances.

1.06 PROPOSED PRODUCTS LIST

A. Within twenty (20) days after date of Owner-Contractor Agreement, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.07 SHOP DRAWINGS

A. Submit in the form of one reproducible transparency and three (3) opaque reproductions. Transparency will be returned to Contractor with appropriate action designations.

B. After return of transparency to Contractor, reproduce and distribute in accordance with Article on Procedures above and for Record Documents described in Section 01700 - Contract Closeout.

1.08 PRODUCT DATA

A. Submit the number of copies which the Contractor requires, plus three (3) copies which will be retained by the Architect/Engineer.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.

C. After review, distribute in accordance with Article on Procedures above and provide copies for Record Documents described in Section 01700 - Contract Closeout.

1.09 SAMPLES

A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

B. Submit samples of finishes from the full range of manufacturers' standard colors or in custom colors if specified or selected, textures, and patterns for Architect/Engineer's selection. Color related materials for interior design shall be submitted at one time for coordination purposes.

1. Submit all color selection items at one time and allow three (3) weeks for color selections by the Architect.

C. Include identification on each sample, with full Project information.

D. Submit the number of samples specified in individual specification Sections; two (2) of which will be retained by Architect/Engineer.

E. Reviewed samples which may be used in the Work are indicated in individual specification Sections.

1.10 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

B. Identify conflicts between manufacturers' instructions and Contract Documents.

1.11 MANUFACTURER'S CERTIFICATES

A. When specified in individual specification Sections, submit manufacturers' certificate to Architect/Engineer for review, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect/Engineer.

1.12 CONSTRUCTION PHOTOGRAPHS

A. Submit to the Architect each month with the request for payment, three (3) low altitude aerial photographs from different vantage points. An initial photograph with no construction activity shall be submitted with the first month's pay request.

END OF SECTION 01300

SECTION 01410 - TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Selections and Payments

B. Laboratory reports

C. Limits on testing laboratory authority

D. Contractor responsibilities

E. Schedules of inspections and tests

1.02 RELATED SECTIONS

A. Section 01300 - Submittals: Manufacturer's certificates

B. Section 01700 - Contract Closeout: Project Record Documents

C. Information Available to Bidders: Soil Investigation Data

D. Additional testing services are required under this contract and are found in other sections of these specifications. Review the entire specification manual for a complete scope of the required testing.

1.03 REFERENCES

A. ANSI/ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

B. ANSI/ASTM E329 - Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

1.04 SELECTION AND PAYMENT

A. Contractor will employ and pay for services of an independent testing laboratory to perform specified inspection and testing.

1.05 LABORATORY REPORTS

A. After each inspection and test, promptly submit two (2) copies of laboratory report to Architect/Engineer and to Contractor.

B. Include:

1. Date issued
2. Project title and number
3. Name of inspector
4. Date and time of sampling or inspection
5. Identification of product and Specifications Section
6. Location in the Project
7. Type of inspection of test
8. Date of test
9. Results of tests
10. Conformance with Contract Documents

C. When requested by Architect/Engineer, provide interpretation of test results.

1.06 LIMITS ON TESTING LABORATORY AUTHORITY

A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. Laboratory may not approve or accept any portion of the Work.

C. Laboratory may not assume any duties of Contractor.

1.07 CONTRACTOR RESPONSIBILITIES

A. Deliver to laboratory at designated location, adequate samples of materials proposed to be used which require testing along with proposed mix designs.

B. Cooperate with laboratory personnel and provide access to the Work (and to manufacturer's facilities).

C. 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, storage and curing of test samples.

D. Notify Architect/Engineer and laboratory twenty-four (24) hours prior to expected time for operations requiring inspection and testing services.

1.08 SCHEDULE OF INSPECTIONS AND TESTS

A. SCOPE OF WORK: The work to be performed by the Testing Laboratory shall be as specified in this Section and throughout and as specified throughout the remainder of these Specifications Manual.

B. EARTHWORK:

1. Tests of Proposed Fill Material: The Contractor's Testing Laboratory shall conduct a survey of the Contractor's proposed location of borrow soil materials and shall establish the suitability of any proposed fill material by determining the required engineering properties. Soil tests shall include soil classification by the Atterberg Limit Tests ASTM D4138, and grain size determination by ASTM D422 "Particle Size Analysis of Soils".

2. Tests of Existing Building Pad: The Contractors's Testing Laboratory shall evaluate the existing building pad and subgrade to determine that this area is properly prepared and compacted as outlined int eh Geotechnical Report.

3. Moisture Density Relationship for Natural and Fill Materials: The Contractor's Testing Laboratory shall provide one optimum moisture density curve for each type of soil, natural, imported fill, or on-site fill, encountered in subgrade and fills under paved areas. Curves shall be generated in accordance with ASTM D1557 "Test Methods for Moisture Density Relationships of Soils and Soil Aggregate Mixtures".

4. Quality Control Testing Required During Construction:

a. Inspection of Subgrade and Fill: The Contractor's Testing Laboratory shall inspect and approved the following subgrades and fill layers before further construction work is performed thereon:

1) Paved Areas: Make at least one field density test of the natural subgrade for every 2500 square feet of paved area but in no case less than three tests. In each compacted fill layer or lift, make one field density test for every 2500 square feet of paved area but in no case less than three tests.

2) Foundation Wall Backfill: Make at least one filed density test for each 200 lineal feet of wall with a minimum of 4 test for each basement wall around the perimeter of the building and a minimum of one test for every other type of foundation wall on the site. Test shall be at random locations and elevations for each wall.

3) Subgrade Beneath Column and Wall Footings: Make at lease one field density test for each column footing and one for each twenty-five lineal feet of wall or fraction thereof.

b. Field Density Tests: Field Density Tests shall be run according to ASTM D1556 "Density of Soil in Place by the Sand Core Method", ASTM D2167 "Density of Soil in Place by the Rubber Balloon Method" or ASTM D2922 "Density of Soil and Soil Aggregate in Place by Nuclear Methods" as applicable.

c. Acceptable Criteria: The results of field density tests by the Contractor's Testing Laboratory will be considered satisfactory if the average of any three consecutive tests has a value not greater than 2 percent below the required density.

d. Report Copies: The Testing Laboratory shall submit all moisture density curves and results of field density tests to the parties specified earlier in this section.

e. Additional Testing: If reports by the Contractor's Testing Laboratory indicate field densities lower than specified above, additional tests will be run by the Contractor's Testing Laboratory with at least the frequencies scheduled above on recompacted fill and/or natural subgrade.

1.09 REINFORCING STEEL

A. Visual Inspection: When the Contractor or reinforcing steel fabricator notifies the Contractor's Testing Laboratory that a shipment of reinforcing steel is in the final stages of fabrication and ready for shipment, the Contractor's Testing Laboratory shall inspect the shipment to determine the following:

1. The bars should be free from injurious defects and shall have a workman-like finish.

2. Deformations shall be of the proper sizes, shapes, and spacing as detailed in ASTM A615.

3. The bars shall not have excessive rust and/or pelting.

4. The bars shall not have any unusual twists or bends.

B. Identified Stock: Where job material is taken from bundles as delivered from the mill, is properly identified as to heat number and is accompanied by mill and analysis test reports, such material shall be used without further local tests provided an affidavit is given from the Supplier to the Contractor's Testing Laboratory that the materials conform with the requirements of the ASTM specification as listed on the structural drawings. In case of controversy, the procedure as stipulated below for unidentified stock shall be followed.

C. Unidentified Stock: For all unidentified stock, the Contractor's Testing Laboratory shall secure samples of the reinforcing steel bars at the time of inspection. The samples shall conform to the following:

1. The sample shall include 2 bars for each ten tons or fraction thereof, of each bar size, heat number, and manufacturer being shipped.

2. The sample bars shall be a minimum of 24 inches in length and should be identical to the material being shipped.

The Contractor's Testing Laboratory shall tag each of the steel bundles with the Laboratory identification tag and appropriately mark the samples corresponding to the steel being inspected and shipped. The fabricator will supply shipping lists showing the weight of each bar size in the shipment. The sample reinforcing bars shall be returned to the Contractor's Testing Laboratory for tensile strength tests and bend tests according to ASTM A615. Bend tests will not be required for #14 and #18 bars.

1.10 CONCRETE MATERIALS AND POURED IN PLACE CONCRETE

A. Concrete Mix Designs: The Contractor shall submit for approval by the Engineer and Contractors Testing Laboratory at least 15 days prior to the start of construction, concrete mix designs for each class of concrete indicated on the structural drawings and in the Specifications.

The Contractor shall not begin work until the applicable mix design has been approved.

1. The Contractor acting in conjunction with his Concrete Supplier and his Testing Laboratory shall submit in writing with his mix designs, whether the concrete is to be proportioned by either of the following methods as outlined in ACI 318:

   a) Field Experience Method

   b) Laboratory Trial Batch Method

   When field experience methods are used to select concrete proportions, establish proportions as specified in ACI 301 and ACI 211. When Laboratory trial batches are used to select concrete proportions, the procedure as outlined in ACI 318 shall be followed. Prepare test specimens in accordance with ASTM C192 and conduct strength tests in accordance with ASTM C39.

2. Required types of concrete and compressive strengths shall be as indicated on the Structural Drawings and as specified in the various sections of the Specifications.

3. All mix designs shall state the following information:

   a) Mix design number or code designation by which the Contractor shall order the concrete from the Supplier.

   b) Structural member for which the concrete is designed (i.e. columns, shear walls, footings, etc.)

   c) Type of concrete whether normal weight or lightweight.

   d) 28 day compressive strength.

   e) Aggregate type, source, size, gradation, fineness modulus.

   f) Cement type and brand.

   g) Fly ash type and brand (if any).

h) Admixtures including air entrainment, water reducers, accelerators, and retarders.

i) Slump

j) Proportions of each material used.

k) Water cement ratio and maximum allowable water content .

l) Method by which the concrete is intended to be placed (bucket, chute, or pump).

4. Concrete Suppliers Record of Quality Control: The concrete supplier's past record of quality control shall be used in the design of the concrete mixes to determine the amount by which the average concrete strength f_c should exceed the specified strength fc as outlined in ACI 318. If a suitable record of tests results is not available, the average strength must exceed the design strength by 1200 PSI as specified in ACI 318. After sufficient data becomes available from the job, the statistical methods of ACI 214 may be used to reduce the amount by which the average strength must exceed fc as outlined in ACI 318.

5. Admixtures:

a) Admixtures to be used in concrete shall be subject to the approval of the Engineer and the Contractor's Testing Laboratory.

b) Quantities of admixtures to be used shall be in strict accordance with the manufacturers instructions.

c) Admixtures containing chloride ions shall not be used.

d) Air entraining admixtures shall conform to "Specification for Air Entraining Admixtures for Concrete" ASTM C260.

e) Water reducing admixtures, retarding admixtures, accelerating admixtures, water reducing and retarding admixtures, and water reducing and accelerating admixtures shall conform to "Specification for Chemical Admixtures for Concrete" ASTM C494.

f) Fly ash or other pozzolons, used as admixtures, shall conform to

"Specification for Fly Ash and Raw or Calcined Natural Pozzolons for use in Portland Cement Concrete" ASTM C618. Obtain mill test reports for approval.

g) Use amounts of admixtures as recommended by the manufacturer for climatic conditions prevailing at the time of placing. Adjust quantities of admixtures as required to maintain quality control.

6. Slump Limits: Unless shown otherwise on the structural drawings, proportion and design mixes to result in concrete slump at the point of placement as follows:

a) Ramps and sloping surfaces - 3" $\pm$ 1"

b) Foundation concrete - 4-1/2" $\pm$ 1-1/2"

c) All other concrete - 4" $\pm$ 1"

When increased workability, pumpability, lower water-cement ratio, shrinkage reduction, or permeability reduction is required, then a superplasticizer admixture shall be considered for use. The maximum slump with the use of superplasticizers shall be 8 inches unless approved otherwise by the Architect/Engineer and Owner's Testing Laboratory.

Any deviation from these values (such as concrete design to be pumped) shall be submitted to the Engineer and Contractor's Testing Laboratory for approval.

7. Lightweight Structural Concrete:

a) Comply with the requirements of ACI 211 and ACI 301.

b) Lightweight concrete aggregate shall conform to the "Specification for Lightweight Aggregates for Structural Concrete" ASTM C330.

c) Provide concrete with a dry unit weight of not more than 116 pounds per cubic foot and not less than 95 pounds per cubic foot. Design mix to produce strengths as indicated on the drawings with a split cylinder strength factor $(fct/(f^{1}c)^{0.5})$ of not less than 5.3 and a drying shrinkage limit of 0.03% at 28 days.

8. Adjustments of Concrete Mixes: Mix design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Such mix design adjustments shall be provided at no additional cost to the Owner. Any adjustments in approved mix designs including changes in admixtures shall be submitted in writing to the Engineer and Contractor's Testing Laboratory for approval prior to field use.

9. Shrinkage: All concrete shall be proportioned for a maximum allowable unit shrinkage of 0.03% at 28 days as determined by ASTM C 157.

10. Chloride Ion Content: A written submittal shall be made with each mix design proposed for use on the project that no soluble chloride ions, all ingredients including admixtures, exists in the concrete mixes.

B. Concrete Test Cylinders by the Contractor's Testing Laboratory:

1. Molding and Testing: Cylinders for strength tests shall be molded and Laboratory cured in accordance with ASTM C31 "Method of Making and Curing Concrete Test Cylinders in the Field" and tested in accordance with ASTM C39 "Method of Testing for Compressive Strength of Cylindrical Concrete Specimens".

2. Field Samples: Field samples for strength tests shall be taken in accordance with ASTM C172 "Method of Sampling Fresh Concrete".

3. Frequency of Testing: Each set of test cylinders shall consist of a minimum of four standard test cylinders. A set of test cylinders shall be made according to the following frequency guidelines:

a) One set for each class of concrete taken not less than once a day.

b) Spread Footings: One set for each 30 cubic yards or fraction thereof.

c) Floors: One set for each 100 cubic yards or fraction thereof but not less than one set for each 5000 square foot floor area.

d) Columns: One set for each 30 cubic yards or fraction thereof.

e) All Other Concrete: A minimum of one set for each 150 cubic yards or fraction thereof.

f) No more than one set of cylinders at a time shall be made from any single truck.

g) If the total volume of concrete is such that the frequency of testing as specified above would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.

h) The above frequencies assume that one batch plant will be used for each pour. If more than one batch plant is used, the frequencies cited above shall apply for each plant used.

The cylinders shall be numbered, dated, and the point of concrete placement in the building recorded. Of the four cylinders per set break one at seven days, two at 28 days, and one automatically at 56 days only if either 28 day cylinder break is below required strength.

4. Additional Cylinder for Form Stripping: One additional cylinder per set will be required for formed slab floors for the purpose of evaluating the concrete strength at the time of form stripping. This cylinder shall be stored on the floor where form removal is to occur under the same exposure conditions as the floor concrete. The cylinder shall be cured under field conditions in accordance with ASTM C31 "Method of Making and Curing Concrete Test Specimens in the Field". Field cured test cylinders shall be molded at the same time and from the same samples as Laboratory cured test specimens. The cylinder shall be broken at the time of form removal as directed by the Contractor.

5. Cylinder Storage Box: The Contractor shall be responsible for providing a protected concrete cylinder storage box at a point on the job site mutually agreeable with the Testing Laboratory for the purpose of storing concrete cylinders until they are transported to the Laboratory.

6. Transporting Cylinders: The Contractor's Testing Laboratory shall be responsible for transporting the cylinders to the Laboratory in a protected environment such that no damage or ill effect will occur to the concrete cylinders.

7. Information on Concrete Test Reports: The Contractor's Testing Laboratory

shall make and distribute concrete test reports after each job cylinder is broken. Such reports shall contain the following information:

a) Truck number and ticket number

b) Concrete Batch Plant

c) Mix design number

d) Accurate location of pour in the structure

e) Strength requirement

f) Date cylinders made and broken

g) Technician making cylinders

h) Concrete temperature at placing

i) Air temperature at point of placement in the structure

j) Amount of water added to the truck at the batch plant and at the site and whether it exceeds the amount allowed by the mix design.

k) Slump

l) Unit weight

m) Air content

n) Cylinder compressive strengths with type of failure if concrete does not meet Specification requirements. Seven day breaks are to be flagged if they are less than 60% of the required 28 day strength. 28 day breaks are to be flagged if either cylinder fails to meet Specification requirements.

C. Other Required Tests of Concrete by the Contractor's Testing Laboratory (unless noted otherwise):

1. Slump Tests: Slump Tests (ASTM C143) shall be made at the beginning of concrete placement for each batch plant and for each set of test cylinders

made.

2. Air Entrainment: Air entrainment (ASTM C233) tests shall be made at the same time slump tests are made as cited above.

3. Concrete Temperature: Concrete temperature at placement shall be measured at the same time slump tests are made as cited above.

D. Evaluation and Acceptance of Concrete:

1. Strength Test: A strength test shall be defined as the average strength of two 28 day cylinder breaks from each set of cylinders.

2. Quality Control Charts and Logs: The Contractor's Testing Laboratory shall keep the following quality control logs and charts for each class of concrete containing more than 2,000 cubic yards. The records shall be kept for each batch plant and submitted on a weekly basis with cylinder test reports.

a) Number of 28 day strength tests made to date.

b) 28 day strength test results containing the average of all strength tests to date, the high test result, the low test result, the standard deviation, and the coefficient of variation.

c) Number of tests under specified 28 day strength.

d) A histogram plotting the number of 28 day cylinders versus compressive strength.

e) Quality control chart plotting compressive strength test results for each test.

f) Quality control chart plotting moving average for strength where each point plotted is the average strength of three previous test results.

g) Quality control chart plotting moving average for range where each point plotted is the average of 10 previous ranges.

3. Acceptance Criteria: The strength level of an individual class of concrete shall be considered satisfactory if both of the following requirements are met:

a) The average of all sets of three consecutive strength tests equal or exceed the required fc.

b) No individual strength test (average of two 28 day cylinder breaks) falls below the required fc by more than 500 PSI.

If either of the above requirements is not met, the Testing Laboratory shall immediately notify the Engineer by telephone. Steps shall immediately be taken to increase the average of subsequent strength tests.

E. Investigation of Low Strength Concrete Test Results:

1. Contractor Responsibility for Low Strength Concrete: If any strength test of laboratory cured cylinders falls below the required fc by more than 500 PSI, the Contractor shall take steps immediately to assure that the load carrying capacity of the structure is not jeopardized.

2. Nondestructive Field Tests: The Contractor's Testing Laboratory shall, under the direction of the Engineer, perform nondestructive field tests of the concrete in question using Swiss Hammer, Windsor Probe, or other appropriate methods as approved by the Engineer and report the results in the same manner as for cylinder test reports.

3. If the likelihood of low strength concrete is confirmed and computations indicate that the load carrying capacity of the structure has been significantly reduced, tests of cores by the Contractor's Testing Laboratory, drilled from the area in question under the direction of the Engineer, will be required in accordance with ASTM C42 "Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete". In such case, three cores shall be taken for each strength test more than 500 PSI below required fc. If concrete in the structure will be dry under service conditions, cores shall be air dried (temperature 60° to 80° F, relative humidity less than 60 percent) for 7 days before test and shall be tested dry. If concrete in the structure will be more than superficially wet under service conditions, cores shall be immersed in water for at least 48 hours and tested wet. The Contractor shall fill all holes made by drilling cores with an approved drypack concrete.

4. Acceptance Criteria for Core Tests: Concrete in an area represented by core tests shall be considered structurally adequate if the average of three cores is equal to at least 85% of fc and if no single core is less than 75% of fc. If approved by the Engineer, locations of erratic core strengths may be retested

to check testing accuracy.

5. Load Test: If the above criteria are not met and the structural adequacy remains in doubt, the Engineer may order a load test specified in ACI 318 for the questionable portion.

6. Strengthening of the Structure or Demolition: If the structural adequacy of the affected portion of the structure remains in doubt, the Engineer may order the structure to be strengthened by an appropriate means or demolished and rebuilt.

7. Cost of Investigations for Low Strength Concrete: The costs of all investigations of low strength concrete shall be borne by the Contractor. The Engineer may elect to hire an additional Testing Laboratory to verify results. The costs associated for this shall be borne by the Contractor.

F. Job Site Inspection:

The scope of the work to be performed by the Testing Laboratory on the job site shall be as follows:

1. Verify that air temperatures at the point of placement in the structure are within acceptable limits defined above prior to ordering of concrete by the Contractor.

2. Inspect concrete upon arrival to verify that the proper concrete mix number, type of concrete, and concrete strength is being placed at the proper location.

3. Inspect plastic concrete upon arrival at the job site to verify proper batching. Observe mix consistency and adding of water as required to achieve target slumps in mix designs. Record the amount of water added and note if it exceeds that allowed in the mix design. The responsibility for adding water to trucks at the job site shall rest only with the Contractor's designated representative. The Contractor is responsible that all concrete placed in the field is in conformance to the Contract Documents.

4. Obtain concrete test cylinders.

5. Perform slump tests and air entrainment tests.

6. Record information for concrete test reports.

7. Verify that all concrete being placed meets job Specifications.

8. Pick up and transport to Laboratory cylinders cast the previous day.

9. Check concrete placing techniques to determine that concrete deposited is uniform and that vertical drop does not exceed six feet.

G. Causes for Rejection of Concrete:

The Contractor shall reject all concrete delivered to the site for any of the following reasons:

1. Wrong class of concrete (incorrect mix design number).

2. Air temperature: Air temperature limits shall be as follows:

   a) Cold Weather: Air temperature must be 40° F and rising

   b) Hot Weather: Air temperature must be cooler than 100°

3. Concrete with temperatures exceeding 95° F may not be placed in the structure.

4. Air contents outside the limits specified in the mix designs

5. Slumps outside the limits specified in the mix designs

6. Excessive Age: Concrete shall be discharged within 90 minutes of plant departure or before it begins to set if sooner than 90 minutes unless approved by the Laboratory or other duly appointed representative.

The Contractor is responsible that all concrete placed in the field is in conformance to the Contract Documents.

H. Concrete Batch Trip Tickets:

All concrete batch trip tickets shall be collected and retained by the Contractor and submitted to the Architect. Compressive strength, slump, air, and temperature tests shall be identified by reference to a particular trip ticket. All tickets shall contain the information specified in ASTM C94. Each ticket shall also show the amount of water that may be added in the field for the entire batch that will not exceed the

specified water cement ratio for the design mix. The Contractor and Owner's Testing Laboratory shall immediately notify the Architect/Engineer and each other of tickets not meeting the criteria specified.

1.11 MASONRY

A. Grout Tests

1. Scope: Grout prism tests shall be required for all grout used in masonry construction.

2. Compressive Strength Test: Specimens shall be 3-1/2" x 3-1/2" x 7" or 3" x 3" x 6" cast in molds with a flat nonabsorbent base and masonry units having the same moisture condition as those being laid forming the sides of the specimens. Specimens shall be capped according to ASTM C617 and tested according to ASTM C39. Each strength test shall be defined as the average of two 28 day prisms.

3. Frequency of Testing: Four grout prisms shall be made for each 30 cubic yards of grout but not less than one set for each day's operation. An additional set should be made whenever the grout mix is changed. One prism shall be tested at 7 days, two at 28 days, and one at 56 days only if either 28 day test is low.

B. Hollow Load Bearing Concrete Masonry Units:

1. Scope: Hollow masonry units shall be tested only for load bearing masonry construction.

2. Compressive Strength Test: Three units from each 10,000 units or fraction thereof shall be tested according to the requirements of ASTM C140 "Sampling and Testing Concrete Masonry Units". Compressive strengths shall meet the requirements of ASTM C90 as specified on the drawings.

C. Experience Requirement: Field inspection of masonry construction by the Contractor's Laboratory as herein described shall be performed by qualified technicians with a minimum of ten years experience in masonry testing and inspection.

END OF SECTION 01410

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone service, water and sanitary facilities.

B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control.

C. Construction Facilities: Access roads, parking, progress cleaning, project signage, and temporary buildings.

1.02 RELATED SECTIONS

A. Section 01700 - Contract Closeout: Final cleaning.

1.03 TEMPORARY ELECTRICITY

A. Provide and pay for power service required from Utility source available at the site.

B. Provide temporary electric feeder from electrical service at location as directed.

C. Provide power outlets for construction operations, with branch wiring and distribution boxes located throughout the structure. Provide flexible power cords as required.

D. Provide main service disconnect and overcurrent protection at convenient location feeder switch at source distribution equipment, meter.

E. Permanent convenience receptacles may not be utilized during construction.

F. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1. Provide 20 ampere duplex outlets, single phase circuits for power tools.

2. Provide 20 ampere, single phase branch circuits for lighting.

1.04 TEMPORARY LIGHTING

A. Provide and maintain incandescent lighting for construction operations to achieve lighting levels adequate for construction being performed.

B. Provide and maintain lighting to exterior staging and storage areas after dark for security purposes without energizing complete temporary service.

C. Provide and maintain 0.25 watt/sq. ft. H.I.D. lighting to interior work areas after dark for security purposes.

D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

E. Maintain lighting and provide routine repairs.

. Permanent building lighting may not be utilized during construction.

1.05 TEMPORARY HEAT

A. Provide and pay for heat devices and heat as required to maintain specified conditions for construction operations.

B. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

C. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress unless indicated otherwise in specifications.

1.06 TEMPORARY VENTILATION

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

B. Provide temporary fan units as required to maintain clean air for construction repairs.

1.07 TELEPHONE/FAX SERVICE

A. Provide, maintain and pay for telephone service to field office.

B. Provide, maintain and pay for a fax machine in the field office.

1.08 TEMPORARY WATER SERVICE

A. Provide, maintain and pay for suitable quality water service required for construction operations. Potable water shall be provided by the Contractor for drinking water.

1.09 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide portable chemical toilets for all personnel. Maintain daily in clean and sanitary condition.

1.10 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction and to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide protection for plant and tree life designated to remain. Replace damaged plant and tree life.

C. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

1.11 FENCING

A. Construction: Commercial grade 6 ft. high chain link fencing with signs to identify the boundary of the construction site.

1.12 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.13 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather-tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified

in individual specification Sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.14 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification Sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protected finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. if traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

1.15 SECURITY

A. Provide security and facilities to protect Work and Owner's operations from unauthorized entry, vandalism or theft.

B. Coordinate with Owner's security program.

1.16 PARKING

A. Designate parking spaces for the Contractor and Subcontractors. This will be done at the preconstruction conference.

1.17 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other

closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.

D. Remove waste materials, debris, and rubbish from site weekly, minimum, and dispose off-site.

1.18 PROJECT IDENTIFICATION

A. 8 w x 4 h foot project sign of exterior grade plywood and wood frame construction, painted, with exhibit lettering by professional sign painter. Architect will provide additional information during the preconstruction conference.

B. List title of project, names of Owner, Architect/Engineer, and Contractor. List phone numbers and address for the Architect/Engineer and General Contractor.

1.19 FIELD OFFICES AND SHEDS

A. Office: Weather-tight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture, drawing rack and drawing display table.

B. Provide space for project meetings, with table and chairs to accommodate eight (8) persons.

C. Locate office and sheds as directed by Architect.

D. General Contractor install pressure treated wood platform, stair and handicapped ramp access to Contractor's trailer. Construction shall be in compliance with all local cods, ADA and State of Florida handicapped requirements.

1.20 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary above grade or buried utilities, equipment facilities, materials, prior to Substantial Completion Inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated or required to restore disturbed area to levels for final landscaping.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 -PRODUCTS

(Not used)

PART 3 - EXECUTION

(Not used)

END OF SECTION 01500

SECTION 01600 - MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Products.

B. Transportation and handling.

C. Storage and protection.

D. Product options.

E. Substitutions

1.02 RELATED SECTIONS

A. Document 01300 - Submittals: Requests for substitutions.

1.03 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.

B. Do not use materials removed from existing premises, except as specifically permitted by the Contract Documents.

C. Provide interchangeable components of the same manufacturer for similar components.

1.04 TRANSPORTATION AND HANDLING

A. Transport and handle products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling,

disfigurement, or damage.

1.05 STORAGE AND PROTECTION

A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.

B. For exterior storage of fabricated products, place on sloped supports, above ground.

C. Provide off-site storage and protection when site does not permit on-site storage or protection.

D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

E. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

G. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

1.06 SUBSTITUTIONS

A. Requests for substitutions will be considered by the Architect and Owner up until ten (10) calendar days prior to the date for receipt of Bids. Requests for substitutions shall be sent to the Architect.

B. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.

C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. A request constitutes a representation that the Bidder/Contractor:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.

2. Will provide the same warranty for the Substitution as for the specified product.

3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension which may subsequently become apparent.

5. Will reimburse Owner for review or redesign services associated with re-approval by authorities.

E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

F. Substitution Submittal Procedure:

1. Submit three (3) copies of request for Substitution for consideration. Limit each request to one proposed Substitution.

2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.

3. The Architect/Engineer will notify Contractor, in writing, of decision to accept or reject request.

PART 2 -PRODUCTS

(Not used)

PART 3 - EXECUTION

(Not used)

END OF SECTION 01600

SECTION 01700 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Closeout procedures.

B. Final cleaning.

C. Adjusting.

D. Project record documents.

E. Operation and maintenance data.

F. Warranties.

G. Spare parts and maintenance materials.

1.02 RELATED SECTIONS

A. Section 01500 - Construction Facilities and Temporary Controls: Progress cleaning.

1.03 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer's inspection.

B. Provide submittals to Architect/Engineer that are required by governing or other authorities.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.04 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Clean interior and exterior glass and surfaces exposed to view; remove temporary

labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to a sanitary condition.

D. Replace filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.05 ADJUSTING

A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.06 PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of the following record documents; record actual revisions to the Work daily and make available for inspection by Architect at each pay request meeting.

1. Contract Drawings.

2. Specifications.

3. Addenda.

4. Change Orders and other Modifications to the Contract.

5. Reviewed shop drawings, product data, and samples.

B. Store Record Documents separate from documents used for construction.

C. Record information concurrent with construction progress.

D. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:

1. Manufacturer's name and product model and number.

2. Product substitutions or alternates utilized.

3. Changes made by Addenda to Modifications.

E. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:

1. Measured depths of foundations in relation to finish first floor datum.

2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

4. Field changes of dimension and detail.

5. Details not on original Contract Drawings.

F. Delete Architect/Engineer title block and seal from all documents.

G. Submit documents to Architect/Engineer with claim for final Application and Payment.

1.07 OPERATION AND MAINTENANCE DATA

A. Submit three sets prior to final inspection, bound in 8-1/2 x 11 inch text pages, three D side ring capacity expansion binders with durable plastic covers.

B. Prepare binder covers with printed title "Operation and Maintenance Instructions", title of project, and subject matter of binder when multiple binders are required.

C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, type on 30 pound white paper.

E. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.

F. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:

1. Significant design criteria.

2. List of equipment.

3. Parts list for each component.

4. Operating instructions.

5. Maintenance instructions for equipment and systems.

6. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.

G. Part 3: Project documents and certificates, including the following:

1. Shop drawings and product data.

2. Air and water balance reports.

3. Certificates.

4. Photocopies of warranties and bonds.

H. Submit one copy of completed volumes in final form 15 days prior to final inspection. This copy will be returned after final inspection, with Architect/Engineer comments. Revise content of documents as required prior to final submittal.

I. Submit final volumes revised, within ten (10) days after final inspection.

1.08 WARRANTIES

A. Provide duplicate notarized copies.

B. Execute and assemble documents from Subcontractors, supplier, and manufacturers.

C. Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.

E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten (10) days after acceptance, listing date of acceptance as start of warranty period.

1.09 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.

B. Deliver to Project site and place in location as directed; obtain receipt prior to final payment.

PART 2 -PRODUCTS

(Not used)

PART 3 - EXECUTION

(Not used)

END OF SECTION 01700

SECTION 02010 - SUBSURFACE INVESTIGATION

PART 1 - GENERAL

A. Soils Investigation Report: One (1) soils investigation report dated September 8, 2005 has been prepared for the site of this work by Universal Engineering Sciences, a copy of which is attached.

B. Use of Data:

1. The report is available for bidders' information, but is not a warranty of subsurface conditions.

2. Bidders should visit the site and acquaint themselves with existing conditions.

1.02 QUALITY ASSURANCE

A. A soils engineer will be retained by the Contractor to observe performance of work in connection with excavation, trenching, filling, backfilling and grading, and to perform compaction tests. This soils engineer shall send his/her reports directly to Spring Engineering, Inc., during the applicable sections of work.

B. Readjust work performed that does not meet technical or design requirements, but make no deviation from the Contract Documents without specific and written approval from the Architect.

C. Any unsuitable material encountered within 5'-0" of the foundation shall be removed and replaced with suitable material approved by the Architect.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 02010

UNIVERSAL
ENGINEERING SCIENCES

GEOTECHNICAL EXPLORATION

Proposed Fire Station # 15
Trinity Boulevard
Odessa, Florida

UES Project No. 80730-005-01

Prepared For:

Spring Engineering, Inc.
3014 US Highway 19
Holiday, Florida 34691

Prepared By:

Universal Engineering Sciences
9802 Palm River Road
Tampa, Florida 33619
(813) 740-8506

September 13, 2005

UNIVERSAL
ENGINEERING SCIENCES
Consultants in: Geotechnical Engineering • Environmental Sciences
Construction Materials Testing • Threshold Inspection • Private Provider Inspection

September 13, 2005

Mark Whitaker
Spring Engineering, Inc.
3014 US Highway 19
Holiday, Florida, 34691

Reference: Geotechnical Exploration
Proposed Fire Station # 15
Trinity Boulevard
Odessa, Florida
UES Project No. 80730-005-01

Dear Mr. Whitaker,

Universal Engineering Sciences, Inc. (UES) has completed a geotechnical exploration on the above-referenced site in Odessa, Florida. Our scope of services was in general accordance with UES Proposal #05-396, dated August 17, 2005, and authorized by you on August 18, 2005.

This report contains the results of our study, an engineering interpretation of the subsurface data obtained with respect to the project characteristics described to us, recommendations for foundation, floor slab, and pavement design, retention pond design, and general construction and site preparation considerations.

We appreciate the opportunity to have worked with you on this project and look forward to a continued association with Spring Engineering. Please do not hesitate to contact us if you should have any questions, or if we may further assist you as your plans proceed.

Respectfully submitted,

UNIVERSAL ENGINEERING SCIENCES, INC.
Certificate of Authorization No. 549

Mark K. Hardy, P.E.
Tampa Branch Manager
Florida License No. 57233
Date 9/13/05

Dr. Edward J. Garbin, Jr., P.E.
Geotechnical Engineering Manager
Florida License No. 61020

MH/EJG:dr

Distribution: Client (2 Bound, 1 Electronic)

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LIST OF APPENDICES

1.0 INTRODUCTION

1.1 GENERAL

In this report we present the results of our geotechnical exploration on the site of the proposed Fire Station #15, located on the south side of Trinity Boulevard, in Odessa, Pasco County, Florida. We have divided this report into the following sections:

- PURPOSE AND METHODOLOGIES - Defines what we did
- FINDINGS - Describes what we encountered
- RECOMMENDATIONS - Discusses what we encourage you to do
- LIMITATIONS - Describes the restrictions inherent in this report
- APPENDICES - Presents support materials referenced in this report.

1.2 PROJECT DESCRIPTION

We understand that the project consists of a proposed single-story fire station with on-grade pavement and on-site stormwater retention ponds. We were provided with a copy of the preliminary site layout and used this in planning our exploration.

No preliminary design plans, grading plans, or anticipated structural loads were available for our analyses. We have assumed that construction will proceed on existing grade. Further, we have assumed that loads on continuous footings will be 4 kips per lineal foot or less, and loads on individual column footings will be 40 kips or less.

Our geotechnical recommendations are based upon the above assumptions and considerations. If any of this information is incorrect or if you anticipate any changes, please inform Universal Engineering Sciences so that we may review our recommendations, and make revisions as needed.

A general location map of the project area appears in Appendix A: Site Location Map. Also included in Appendix A for your reference are a Site Aerial Photograph, Topographic Map, and SCS Soil Survey Map.

2.0 PURPOSE AND METHODOLOGIES

2.1 PURPOSE

The purpose of our services was:

- to explore the general subsurface conditions at the site using SPT and auger borings;

- to interpret and review the subsurface conditions with respect to the proposed construction as described to us; and

- to provide geotechnical engineering information for foundation and pavement design, retention pond design, and general recommendations for site preparation.

This report presents an evaluation of site conditions on the basis of traditional geotechnical procedures for site characterization. The recovered samples were not examined, either visually or analytically, for chemical composition or environmental hazards.

Our study was confined to the zone of soil likely to be influenced by the proposed structural foundation and pavement systems. Our scope of services did not address the potential for surface expression of deep geological conditions, such as sinkhole development related to karst activity.

2.2 FIELD EXPLORATION

The subsurface conditions across the site were explored with a total of eight (8) borings. In the proposed pavement areas, five (5) bucket auger borings were advanced, each to a depth of 6 feet below the ground surface (bgs). Soil samples were collected from the auger cuttings wherever a visible change in stratigraphy was apparent.

In the proposed building and pond area, a total of three (3) borings were completed, each to depths of 15 to 25 feet bgs. These borings were advanced using the rotary wash method, and samples were collected while performing the Standard Penetration Test (SPT) at regular intervals.

We performed the SPT test in general accordance with ASTM D-1586 guidelines. However, at depths of 10 feet or less we sampled continuously in order to detect slight variations in the soil profile. In general, a standard split-barrel sampler (split-spoon) is driven into the soil using a 140-pound hammer free-falling 30 inches. The number of hammer blows required to drive the sampler 12 inches, after first seating it 6 inches, is designated the penetration resistance, or SPT-N value. This value is used as an index to soil strength and consistency.

Consider the indicated locations and depths to be approximate. Our drilling crew located the borings based upon estimated distances and taped measurements from existing site features. If more precise location and elevation data are desired, a registered professional land surveyor should be retained to locate the borings and determine their ground surface elevations. The Boring Location Plan is presented in Appendix B.

Soil, rock, water, and/or other samples obtained from the project site are the property of UES. Unless other arrangements are agreed upon in writing, UES will store such samples for no more than 60 calendar days from the date UES issued the first document that includes the data obtained from these samples. After that date, UES will dispose of all samples.

2.3 LABORATORY TESTING

The soil samples recovered from the test borings were returned to our laboratory and visually classified by our technical staff. Selected samples from the pond-area borings were tested for hydraulic conductivity and porosity. The results of this testing are presented in Section 4.5.1 of this report.

3.0 FINDINGS

3.1 SURFACE CONDITIONS

At the start of our geotechnical exploration, we reviewed aerial photographs available from the Pasco County Property Appraiser's office and TerraServer USA, USGS topographic quadrangle maps, and the USDA Soil Conservation Service (SCS) Soil Survey of Pasco County for relevant information about the site. According to USGS topographic information, the elevation across the property varies from +35 feet to +40 feet NGVD-29. The site is lightly wooded.

3.2 SUBSURFACE CONDITIONS

3.2.1 SOIL SURVEY

According to SCS, there are two native, surficial soil groups underlying this site. A summary of selected properties for the identified soil groups on the site is included below in Table 1.

TABLE 1
SUMMARY OF SOIL INFORMATION

Soil Map Unit & Name	Hydrologic Soil Group	Water Table Type	SHWT Depth	Shrink-Swell Potential	Corrosion Risk	
					Steel	Concrete
8-Sellers Mucky Loamy Fine Sand	B/D	Apparent	+2' to 0'	Low	High	High
22-Basinger Fine Sand	A/D	Apparent	0' to -1'	Low	High	Moderate

3.2.2 SOIL BORINGS

The boring locations and detailed subsurface conditions are illustrated in Appendix B: Boring Location Plan and Boring Logs. The classifications and descriptions shown on the logs are based upon visual characterizations of the recovered soil samples. Refer to Appendix B: Soils Classification Chart, for further explanation of the symbols and placement of data on the Boring Logs. The general subsurface soil profile on the site, based on the soil boring information, is described below. For more detailed information, please refer to the boring logs.

The subsurface stratigraphy encountered at the boring locations began with an upper layer of silty fine sand (SM) and sand with silt (SP-SM) that extended to the termination depth of 6 feet below the ground surface in the hand auger borings and to depths of 7 to 12 feet in the SPT borings. These sands were underlain by sand with clay (SP-SC) or sandy clay (CL) that extended to the boring termination depth of 15 feet in boring P-1 and to depths of 12 feet in borings B-1 and B-2. The borings then contacted highly weathered to weathered limestone that extended to the boring termination depths of 25 feet.

The shallow water table was encountered approximately 3 to 4 feet below existing grade at the boring locations. These readings were unstabilized and are subject to fluctuation.

The boring logs and related information included in this report are indicators of subsurface conditions only at the specific locations and times noted. Subsurface conditions, including groundwater levels and the presence of deleterious materials, at other locations on the site may differ significantly from conditions which, in the opinion of UES, exist at the sampling locations. Note, too, that the passage of time may affect conditions at the sampling locations.

4.0 RECOMMENDATIONS

4.1 GENERAL

In this section of the report we present our recommendations for building foundation and floor slab design, pavement design, retention pond design, general site preparation, and construction related services. These recommendations are made based upon a review of the attached soil test data, our understanding of the proposed construction as it was described to us, and our stated assumptions. If the grading plans or the site layout differ from those assumed or described to us, we should be retained to review the new or updated information and amend our recommendations with respect to those changes. Additionally, if subsurface conditions are encountered during construction that were not encountered in the test borings, report those conditions immediately to us for observation and recommendations.

4.2 GROUNDWATER CONTROL

Based upon our visual inspection of the recovered soil samples, review of information obtained from SWFWMD and the USDA Soil Survey of Pasco County, and our knowledge of local and regional hydrogeology, our best estimate is that the seasonal high groundwater level could be on the order of 2 feet below the existing grade at the test boring locations, on average. Refer to the Boring Logs in Appendix B for location-specific estimates.

Several factors influence the determination of the seasonal high water table (SHWT). When soils are subjected to alternating cycles of saturation and drying, discoloration or staining that is not part of the dominant soil color occurs. This is called mottling, and manifests itself in various shades of gray, brown, red or yellow. There are numerous processes that lead to this discoloration, including mineral accretions, oxidation, and bacteria growth within the soil. The presence of this discoloration indicates that groundwater has, at some point in time, reached that elevation and remained there long enough to cause any or all of these processes to occur. The SHWT elevation

is assumed to be the highest point at which mottling is observed, regardless of whether water is present at the time of observation. This estimate is independent of the actual location of the groundwater table.

Also, wherever limestone is encountered in a proposed retention pond area, SWFWMD will require at least 2-feet of separation between the bottom of the pond and the top of the limestone. This requirement is in place to maintain higher quality water recharging the Floridan aquifer, and is an important consideration when a pond is to be excavated in an area where shallow limestone is present. In such an area, the SHWT depth will be set a minimum of 2 feet higher than the top of limestone depth, regardless of whether other soil indicators suggest a deeper level.

It should be noted that the estimated SHWT does not provide any assurance that groundwater levels will not exceed this level in the future. Should impediments to surface water drainage exist on the site, or should rainfall intensity and duration exceed the normally anticipated amounts, groundwater levels may exceed our seasonal high estimate. Also, future development around the site could alter surface runoff and drainage characteristics, and cause our seasonal high estimate to be exceeded. We therefore recommend positive drainage be established and maintained on the site during construction. Further, we recommend permanent measures be constructed to maintain positive drainage from the site throughout the life of the project. Finally, we recommend all foundation and pavement grades account for the seasonal high groundwater conditions.

Temporary dewatering may be required for some parts of this site if construction proceeds during the wet season, particularly if deep excavations are necessary or if pumping of the surficial materials is experienced during earthworking operations. Where they were encountered, sands with silts (SP-SM), silty fine sands (SM), and clayey sands (SC) near the surface may be prone to pumping in response to normal construction vehicular traffic and earthworking operations. Therefore, we recommend that the contract documents provide for determining the depth to the groundwater table just prior to construction, and for any required remedial dewatering. Further, we recommend that the groundwater table be maintained at least 24 inches below all earthwork and compaction surfaces.

We recommend the dewatering contractor submit a "Dewatering Plan", indicating the projected zone of influence, method of installation, and anticipated timing of pumping. Further, we recommend that a representative of Universal Engineering Sciences review this submittal to evaluate whether the contractor's plans follow the design intent and to monitor the dewatering activities to see that the contractor's work accomplishes the design criteria.

4.3 BUILDING FOUNDATION AND FLOOR SLAB

4.3.1 BUILDING FOUNDATION

The soil strata encountered at the SPT boring locations should be adaptable to support a structure having loading conditions within our stated assumptions using conventional shallow foundations, provided the upper soils are densified to at least 95% of the modified Proctor maximum dry density (ASTM D-1557) prior to foundation construction. We recommend using shallow strip or spread foundations, or a thickened edge monolithic slab, sized to exert a maximum soil bearing stress of

2,500 pounds per square foot (psf). All individual foundations should be embedded at least 2.0 feet below lowest adjacent grade (finished surrounding grade, for example). For integrated foundation/slab systems, the minimum embedment depth may be decreased to 1.5 feet.

Maintain minimum foundation widths of 24 inches for continuous strip footings, and 36 inches for isolated column footings, even though the maximum allowable soil bearing stress may not be developed in all cases. For integrated foundation/slab systems, the minimum strip footing width can be reduced to 16 inches. We estimate that foundations so designed will have a minimum factor of safety of two against bearing capacity failure.

4.3.2 STANDARD FLOOR SLAB

For the floor slab, we recommend using a standard concrete slab-on-grade system. A fibermesh mix should be used to control thermal cracking. Optionally, welded wire mesh could be used for crack control. If welded wire is used, we recommend using flat wire instead of rolled. Normal weight concrete having a 28-day compressive strength (f'c) of at least 3000 psi should be used. A modulus of subgrade reaction of 175 pci can be used beneath the proposed floor slab, assuming the slab is supported on compacted structural fill or well compacted existing subgrade soils (minimum 95% Modified Proctor).

4.3.3 FLOOR SLAB MOISTURE CONTROL

We recommend installing a minimum 6-mil, polyethylene vapor barrier between the bottom of the floor slab and the top of the compacted subgrade. This will help to minimize floor dampness and moisture intrusion into the structure through the slab. Assume a coefficient of friction of 0.2 at the soil-slab interface if a vapor barrier is used. If no vapor barrier is used, assume a coefficient of friction of 0.35 at the interface.

4.3.4 ESTIMATED STRUCTURAL SETTLEMENT

For foundations designed as recommended and site earthwork accomplished according to the recommendations provided later in this report, we estimate total foundation settlement of less than one inch, and differential settlement of less than one half inch. However, if the site is not prepared according to the guidelines provided later in this report, our estimates of total and differential settlement may be exceeded during the design life of the structure.

4.4 PAVEMENT SECTIONS

4.4.1 GENERAL

We recommend using a flexible pavement section on this project. Flexible pavements combine the strength and durability of several layer components to produce an appropriate and cost-effective combination of available materials.

4.4.2 LAYER COMPONENTS

For preliminary pavement designs, we recommend using a three-layer pavement section consisting of stabilized subgrade, base course, and surface course placed on top of existing subgrade or a compacted embankment.

We recommend that light duty pavement sections have a minimum of 6 inches of stabilized subgrade, 6 inches of base course, and a minimum of 1.5 inch of surface course, and that medium duty pavement sections have 8 inches of stabilized subgrade, 8 inches of base course, and 2 inches of surface course. For heavy duty sections, we recommend a 10 inch stabilized subgrade, 10 inch base course and 2 inch surface course.

The minimum recommended thicknesses may lead to more than normal periodic maintenance and may not meet typical life expectancies for some pavements. If projected traffic loads become available, we recommend that an appropriate pavement design be used and the component thicknesses be adjusted accordingly.

Because traffic loadings are commonly unavailable, we have generalized our pavement design into three groups. The group descriptions and the recommended component thicknesses are presented in Table 2: Pavement Component Recommendations. The structural numbers in Table 2 are based on a structural number analysis with the stated estimated daily traffic volume for a 15-year placement design life. For loading conditions greater than those presented in Table 2, we recommend that you have a complete pavement design performed based on projected traffic data.

TABLE 2
FLEXIBLE PAVEMENT COMPONENT RECOMMENDATIONS

Traffic Group	Required Structural Number	Provided Structural Number	Component Thickness (inches)		
			Stabilized Subgrade	Base Course	Surface Course
Light-duty	1.9	2.1	6	6	1.5
Medium-duty	2.4	2.8	8	8	2.0
Heavy-duty	3.0	3.2	10	10	2.0

Light-duty: auto parking areas; over eighty cars; light panel and pickup trucks; average gross weight of 4,000 pounds, total equivalent 18-kip single axle loads (ESALs) equals 30,000

Medium-duty: commercial driveways, small roadways; twenty trucks or less per day; average gross vehicle weight of 25,000 pounds, total ESALs equals 150,000

Heavy-duty: Occasional heavy truck traffic, total ESALs equals 750,000

4.4.3 STABILIZED SUBGRADE

We recommend that subgrade materials be compacted to at least 98 percent of Modified Proctor Maximum Dry Density (ASTM D1557) according to the requirements in the "Site Preparation" section of this report. Further, stabilize the subgrade materials to a minimum Limerock Bearing Ratio (LBR) of 40 as specified by Florida Department of Transportation (FDOT) requirements for Type B or Type C Stabilized Subgrade. The stabilized subgrade should be "free draining" when overlain by crushed concrete base.

The stabilized subgrade can be imported material or a blend of on-site soils and imported materials. If a blend is proposed, we recommend that the contractor perform a mix design to find the optimum mix proportions.

4.4.4 BASE COURSE

We recommend using either limerock* or a crushed concrete base course material. Soil-cement may also be used, but may not be economical. The base utilized should have a minimum LBR of 100, and should meet current FDOT requirements for graded aggregate base. Place the base in maximum 6-inch lifts and compact each lift to a minimum density of 98 percent of the Modified Proctor maximum dry density.

Perform compliance base density testing to a depth of 1-foot at a frequency of one test per 10,000 square feet, or at a minimum of two test locations, whichever is greater.

Note: If limerock base material is to be used, adequate separation between groundwater and the base must be maintained (see Section 4.4.7). Limerock is highly moisture sensitive and becomes unstable when saturated. Therefore, if the guidelines discussed in Section 4.4.7 cannot be met, the use of limerock base on this project is not recommended.

4.4.5 FLEXIBLE SURFACE COURSE

In light duty areas where there is occasional truck traffic, but primarily passenger cars, we recommend using an asphaltic concrete, FDOT Type S-III, which has a minimum stability of 1,000 pounds. In heavy duty pavement areas, we recommend FDOT Type S-1 asphaltic concrete, which has a minimum stability of 1500 pounds.

Asphaltic concrete mixes should be a current FDOT approved design of the materials actually used. Test samples of the materials delivered to the project to verify that the aggregate gradation and asphalt content satisfies the mix design requirements. Compact the asphalt to a minimum of 95 percent of the Marshall design density.

After placement and field compaction, core the wearing surface to evaluate material thickness and to perform laboratory densities. Obtain cores at frequencies of at least one core per 3,000 square feet of placed pavement or a minimum of two cores per day's production.

In parking lots, for extended life expectancy of the surface course, we recommend applying a coal tar emulsion sealer at least six months after placement of the surface course. The seal coat will help to patch cracks and voids, and protect the surface from damaging ultraviolet light and automobile liquid spillage. Please note that applying the seal coat prior to six months after placement may hinder the "curing" of the surface course, leading to its early deterioration.

4.4.6 RIGID PAVEMENT OPTION

Alternatively, we recommend using rigid concrete pavement for increased durability, strength, and longer life in heavily loaded areas such as aprons and driveways. Concrete pavement is a rigid system that distributes wheel loads to the subgrade soils over a larger area than a flexible asphalt pavement. This results in reduced localized stress to the subgrade soil. We recommend using a compacted subgrade below concrete pavement with the following stipulations:

1. Subgrade soils must be densified to at least 98 percent of Modified Proctor test maximum dry density (ASTM D 1557) for a depth of at least 1-foot directly below the bottom of concrete slab.

2. The surface of the subgrade soils must be smooth, and any disturbances or wheel rutting corrected prior to placement of concrete.

3. The subgrade soils must be moistened prior to placement of concrete.

4. Concrete pavement thickness should be uniform throughout, with exception to the thickened edges (curb or footing).

5. The bottom of the pavement should be separated from the estimated seasonal high groundwater level by at least 12 inches.

Our recommendations on slab thickness for standard duty concrete pavements are based on (1) the subgrade soils densified to at least 98 percent of Modified Proctor test maximum dry density (ASTM D 1557), (2) modulus of subgrade reaction (k) equal to 150 pounds per cubic inch, (3) a 20-year design life, and (4) total equivalent 18 kip single axle loads (ESAL) of 300,000. Our recommended design for heavy duty concrete pavement is shown in Table 3 below.

TABLE 3
RIGID PAVEMENT COMPONENT RECOMMENDATIONS - HEAVY DUTY

Minimum Pavement Thickness	Maximum Control Joint Spacing	Minimum Sawcut Depth
6 Inches	14 Feet x 14 Feet	1.5 Inches

For both standard duty and heavy duty rigid pavement sections, we recommend using normal weight concrete having a 28 day compressive strength (f'_c) of 4,000 psi, and a minimum 28-day flexural strength (modulus of rupture) of at least 600 pounds per square inch (based on the 3 point flexural test of concrete beam samples). Layout of the sawcut control joints should form square panels, and the depth of sawcut joints should be at least ¼ of the concrete slab thickness.

We recommend allowing Universal Engineering Sciences to review and comment on the final concrete pavement design, including section and joint details (type of joints, joint spacing, etc.), prior to the start of construction.

For further details on concrete pavement construction, please reference the "Guide to Jointing of Non-Reinforced Concrete Pavements" published by the Florida Concrete and Products Association, Inc., and "Building Quality Concrete Parking Areas," published by the Portland Cement Association.

4.4.7 EFFECTS OF GROUNDWATER

One of the most critical influences on pavement performance in Florida is the relationship between the pavement subgrade and the seasonal high groundwater level.

It has been our experience that many roadways and parking areas have been damaged as a result of deterioration of the base and the base/surface course bond due to moisture intrusion. Regardless of the type of base selected, we recommend that the seasonal high groundwater and the bottom of the base course be separated by at least 18-inches.

At this site pavement constructed on or above existing grade should meet the minimum required separation, however, water may pond near the surface after periods of heavy or extended rainfall. This will adversely affect any moisture sensitive base material, such as limerock. Therefore, additional measures should be considered such as either raising the site grade using select fill until the required separation is achieved, or permanently lowering the water table using underdrains, ditching, or a suitable alternative.

4.4.8 CURBING

We recommend that curbing around any landscaped sections adjacent to the parking lots and driveways be constructed with full-depth curb sections. Using extruded curb sections which lie directly on top of the final asphalt level, or eliminating the curbing entirely, can allow migration of irrigation water from the landscape areas to the interface between the asphalt and the base. This migration often causes separation of the wearing surface from the base and subsequent rippling and pavement deterioration.

4.4.9 UNDERDRAINS

Underdrains should consist of 6-inch perforated plastic pipe wrapped in a drain sock. The pipe should be surrounded by filter material meeting FDOT requirement Section 902.2. The pipe should be encased within filter material with at least 6 inches below, 6 inches above, and 6 inches around each side. The invert of the drain pipe should be located at least 36 inches below the bottom of the pavement base course. For parallel underdrains, the center to center spacing of the pipes should be no greater than 15 feet.

Additional underdrain action can be achieved by bedding any stormwater pipe trenches with coarse gravel, such as FDOT #57 stone, beneath the pipes for at least 6 inches and for at least 6 inches up the sides of the pipes.

4.4.10 CONSTRUCTION TRAFFIC

Light duty roadways and incomplete pavement sections will not perform satisfactorily under construction traffic loadings. We recommend that construction traffic (construction equipment, concrete trucks, sod trucks, garbage trucks, dump trucks, etc.) be re-routed away from these roadways or that the pavement section be designed for these loadings.

4.5 RETENTION PONDS

4.5.1 DESIGN SOIL PARAMETERS

Representative samples from the pond-area boring was chosen for laboratory testing for hydraulic conductivity and porosity. The average results for the boring tested are listed in Table 4. Also listed is the estimated base of aquifer elevation at the boring location, if encountered. This corresponds to the depth at which confining unit soils such as clayey sands and sandy clays are first contacted.

TABLE 4
STORMWATER POND DESIGN PARAMETERS

Boring ID	Sample Depths (feet)	Horizontal Hydraulic Conductivity, k_h (feet/day)	Porosity, n (%)	Base of Aquifer Elevation (feet)
P-1	0 to 10	5	35	NE

NE = Not Encountered

4.5.2 DRI TESTING

A DRI test was not completed at this time because the seasonal high water level was estimated to be within 2 feet of the existing ground surface.

4.5.3 FILL SOIL SUITABILITY

The recovered soil samples were classified using visual and textural means. We offer below preliminary guidelines for the use of on-site soils, such as those excavated from the proposed retention pond, as fill material for the project.

Soil materials excavated and classified as fine sands to slightly silty fine sands (SP, SP-SM), with typically 12% fines or less (silt/clay fraction), may be considered suitable for use as utility trench backfill, as well as building pad and pavement subgrade structural fill, provided said materials are properly dried, placed, and compacted.

Soil materials excavated and classified as silty to slightly clayey fine sands (SM, SP-SC), with typically 12% to 25% fines, may also be considered suitable for use as utility trench backfill, as well as building pad and pavement subgrade structural fill, after significant drying and some mixing with the fine sand material described above. Proper placement and compaction must also be ensured.

Soil materials excavated and classified as clayey sand, silt or clay (SC, ML, MH, CL, CH) and any organic-laden soils (5% or greater organics by weight) should not be reused as fill beneath buildings or pavement sections. These materials could be used in green areas, if applicable, and in non-structural applications where excessive ground subsidence will not create functional or aesthetic problems. Note: clayey sand (SC) soils may be used depending upon percent fines, liquid and plastic limits. These soils are very moisture sensitive and should be evaluated during construction with adequate quality assurance measures.

4.6 SITE PREPARATION

We recommend normal, good-practice site preparation procedures. These procedures include stripping the site of vegetation, proof-rolling and proof-compacting the subgrade, and filling to grade with engineered fill as needed.

A more detailed synopsis of this work is as follows:

1. If required, perform remedial dewatering prior to any earthwork operations. We recommend temporary dewatering to reduce the likelihood of pumping of the shallow subgrade soils during normal construction operations. Maintain groundwater levels at least 24 inches below the lowest anticipated cut and/or all compaction surfaces.

2. Strip the proposed construction limits of all grass, roots, topsoil, construction debris, and other deleterious materials within and 10 feet beyond the perimeter of the proposed building and in all paved areas. Expect clearing and grubbing to depths of 10 to 12 inches. Deeper clearing and grubbing depths may be required where major root systems are encountered.

3. Proof-roll the subgrade with a heavily loaded, rubber-tired vehicle under the observation of a Universal Engineering Sciences geotechnical engineer or his representative. Proof-rolling will help locate any zones of especially loose or soft soils not encountered in the soil test borings. Then undercut, or otherwise treat these zones as recommended by the engineer.

4. Prior to any filling of the site, proof-compact the subgrade from the surface using suitable compaction equipment, until you obtain a minimum density of 95 percent of the Modified Proctor maximum density (ASTM D-1557), to a depth of 2 feet below stripped grade. In order to achieve the required degree of compaction, the soils may need to be moisture conditioned until the in-situ water content is within +/- 2% of the optimum moisture content (OMC).

5. Test the subgrade for compaction at a frequency of not less than one test per 2,500 square feet per foot of depth improvement in the building areas. In paved areas, perform compliance tests on the stabilized subgrade for full depth at a frequency of one test per 10,000 square feet, or at a minimum of two test locations, whichever is greater.

6. Place fill material, as required. The fill should consist of fine to medium sand with less than 5 percent soil fines. You may use fill materials with soil fines between 5 and 12 percent, but strict moisture control may be required. Place fill in uniform 10 to 12 inch loose lifts and compact each lift to a minimum density of 95 percent of the Modified Proctor maximum density at a moisture content of +/- 2% of optimum (OMC).

7. Perform compliance tests within the fill at a frequency of not less than one test per 2,500 square feet per lift in the building areas, or at a minimum of two test locations, whichever is greater. In paved areas, perform compliance tests at a frequency of not less than one test per 10,000 square feet per lift, or at a minimum of two test locations, whichever is greater.

8. Test all final footing cuts for compaction to a depth of 2 feet. Additionally, we recommend you test one out of every four column footings, and one test per every 50 lineal feet of wall footing.

Using vibratory compaction equipment at this site may disturb adjacent structures. We recommend you monitor nearby structures before and during proof-compaction. If disturbance is noted, halt vibratory compaction and inform Universal Engineering Sciences immediately. We will review the compaction procedures and evaluate if the compactive effort results in a satisfactory subgrade complying with our original design assumptions.

4.7 CONSTRUCTION RELATED SERVICES

Universal Engineering Sciences (UES) operates and maintains an in-house, Florida Department of Transportation certified Construction Materials Testing laboratory. Our technicians are highly trained and experienced, and our engineering staff is already familiar with the details of your project. Therefore, we recommend the owner retain UES to perform construction materials testing and field observations on this project. This includes monitoring all stripping and grading, observation of foundation excavation and construction, and verification of pavement subgrades.

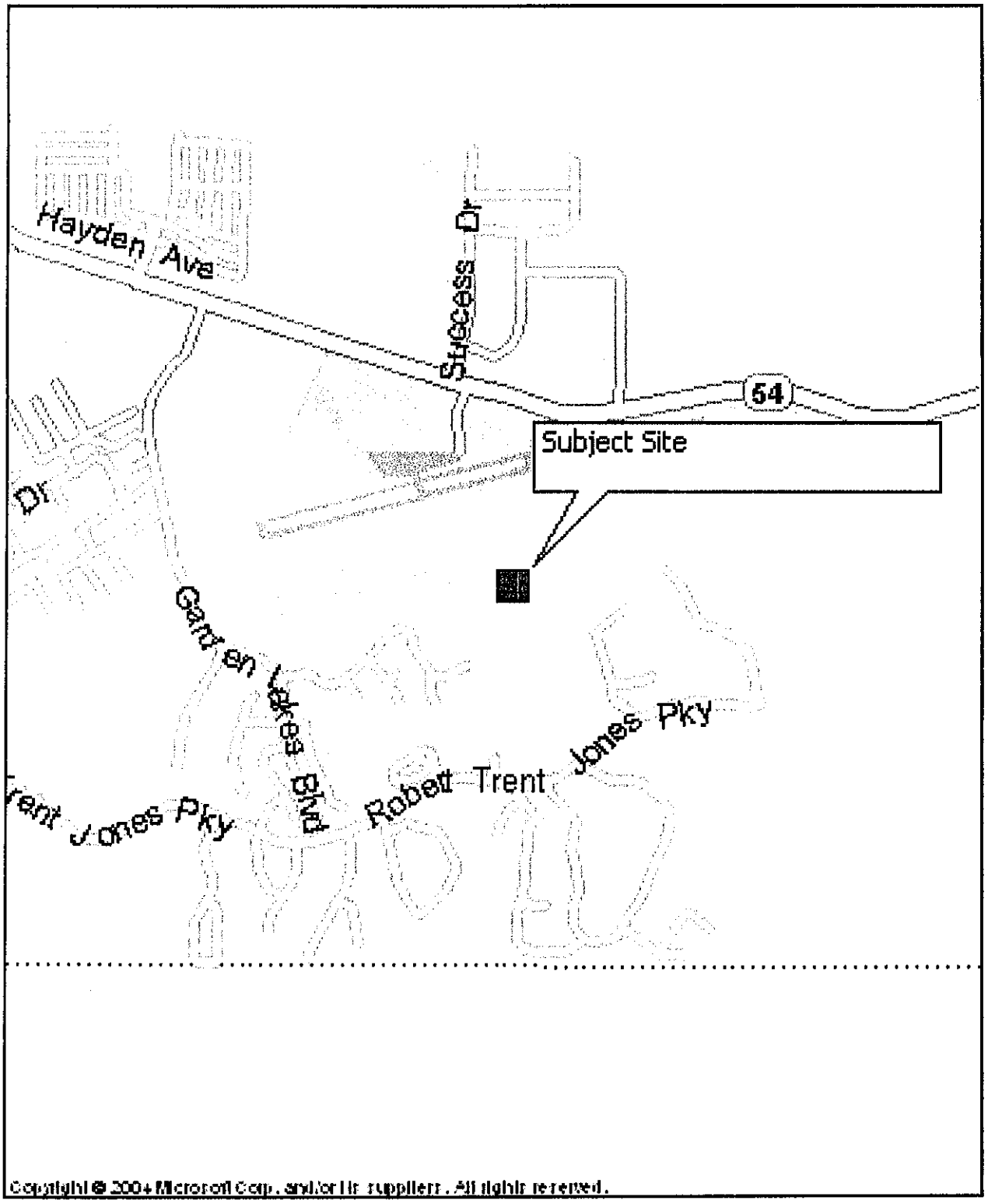
The geotechnical engineering design does not end with the advertisement of the construction documents. It is an on-going process throughout construction. Because of our familiarity with the site conditions and the intent of the engineering design, our engineers are the most qualified to address problems that might arise during construction in a timely and cost-effective manner.

5.0 LIMITATIONS

During the early stages of most construction projects, geotechnical issues not addressed in this report may arise. Because of the natural limitations inherent in working with the subsurface, it is not possible for a geotechnical engineer to predict and address all possible subsurface variations. An Association of Engineering Firms Practicing in the Geosciences (ASFE) publication, "Important Information About Your Geotechnical Engineering Report" appears in Appendix C, and will help explain the nature of geotechnical issues. Further, we present documents in Appendix C: Constraints and Restrictions, to bring to your attention the potential concerns and the basic limitations of a typical geotechnical report.

Do not apply any of this report's conclusions or recommendations if the nature, design, or location of the facilities is changed. If changes are contemplated, UES must review them to assess their impact on this report's applicability. Also, note that UES is not responsible for any claims, damages, or liability associated with any other party's interpretation of this report's subsurface data or reuse of this report's subsurface data or engineering analyses without the express written authorization of UES.

APPENDIX A



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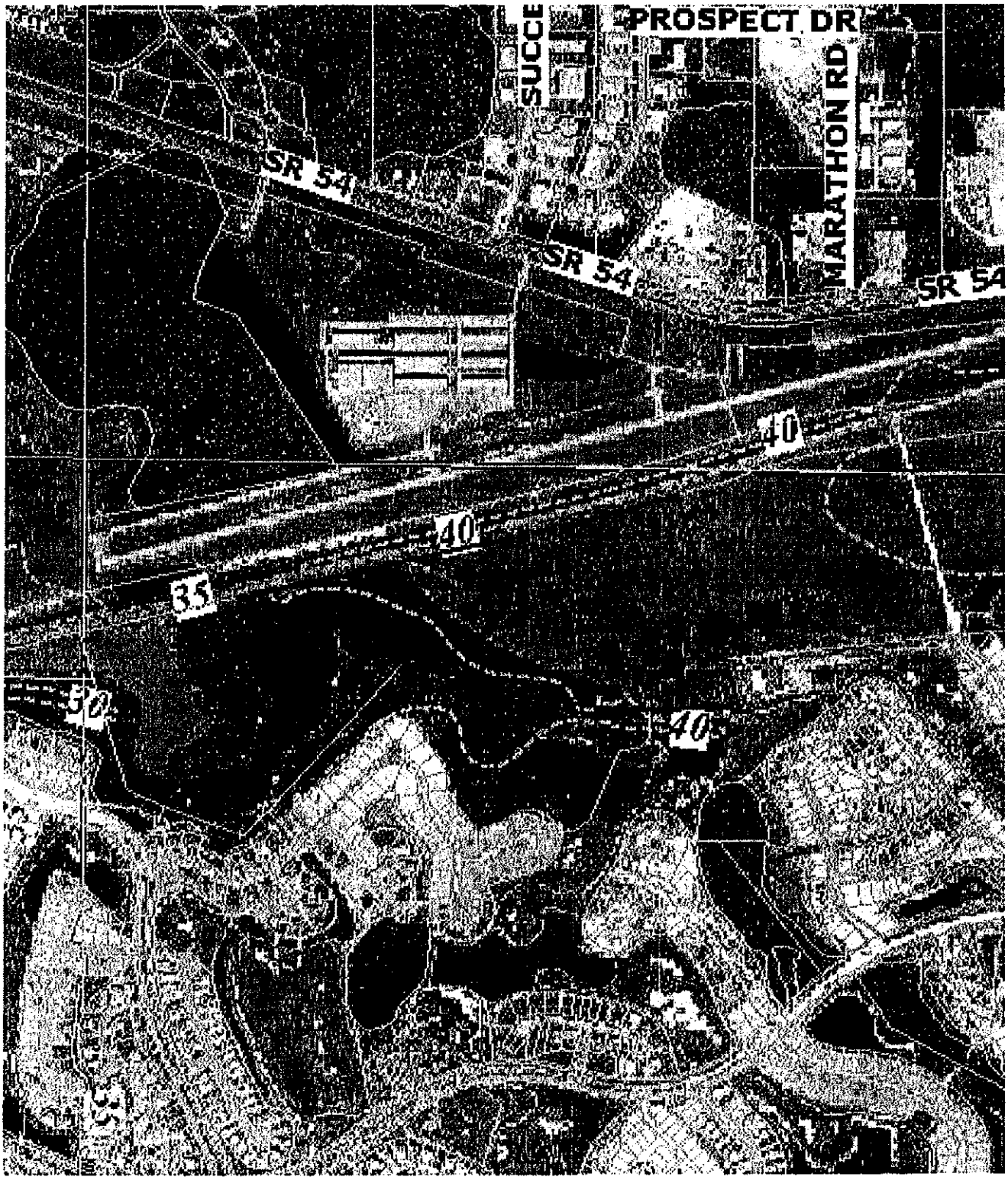
PROPOSED FIRE STATION #15
TRINITY BLVD.
ODESSA, FLORIDA

SITE LOCATION MAP

DRAWN BY: J.C.	DATE: AUG. 30, 2005	CHECKED BY: E.J.G.	DATE: AUG. 30, 2005
SCALE: NOT TO SCALE	PROJECT NO: 80730-005-01	REPORT NO:	APPENDIX: A



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PROPOSED FIRE STATION #15
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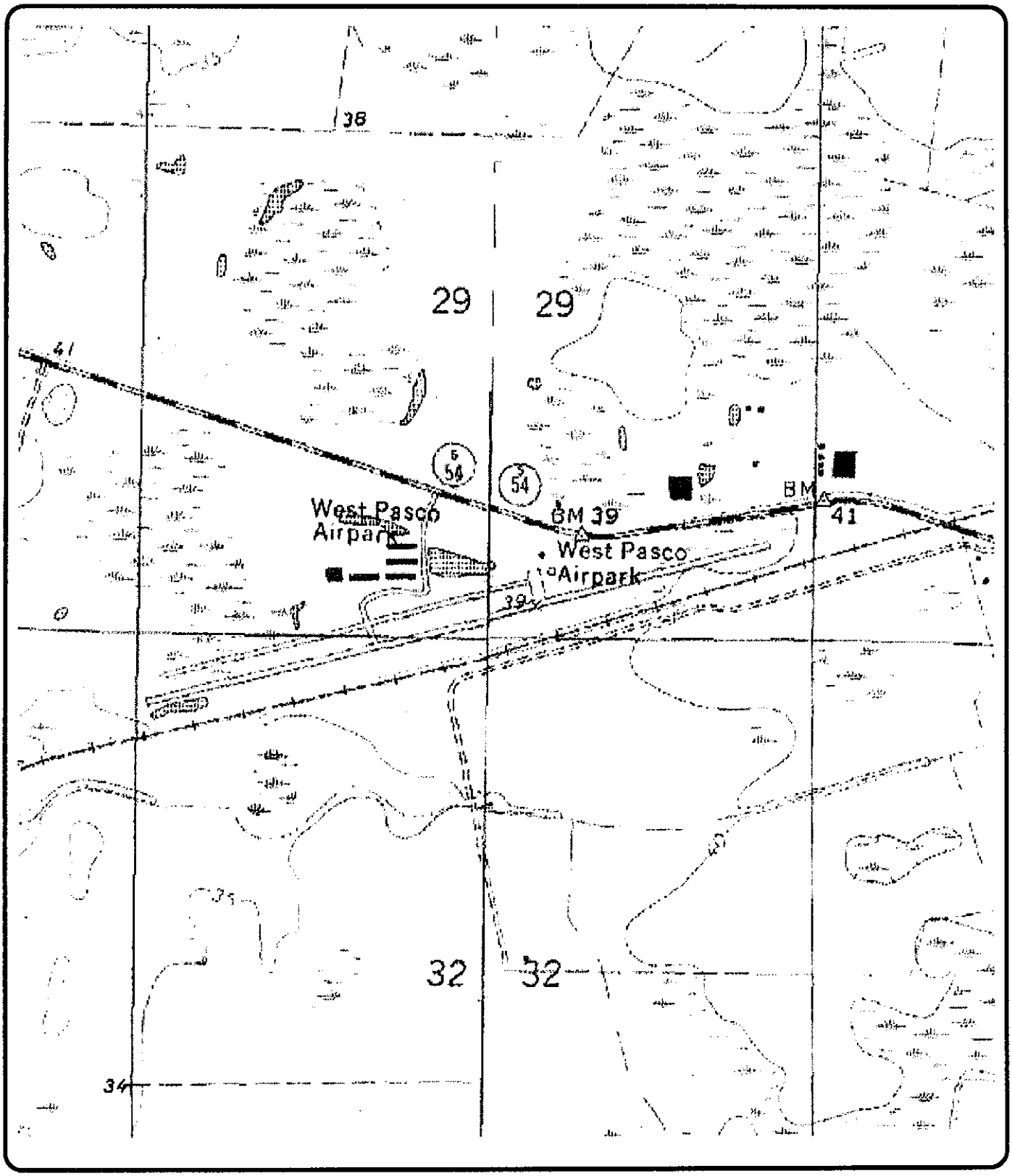
ODESSA, FLORIDA

SITE AERIAL PHOTOGRAPH

DRAWN BY: J.C.	DATE: AUG. 30, 2005	CHECKED BY: E.J.G.	DATE: AUG. 30, 2005
SCALE: NOT TO SCALE	PROJECT NO: 80730-005-01	REPORT NO:	APPENDIX: A



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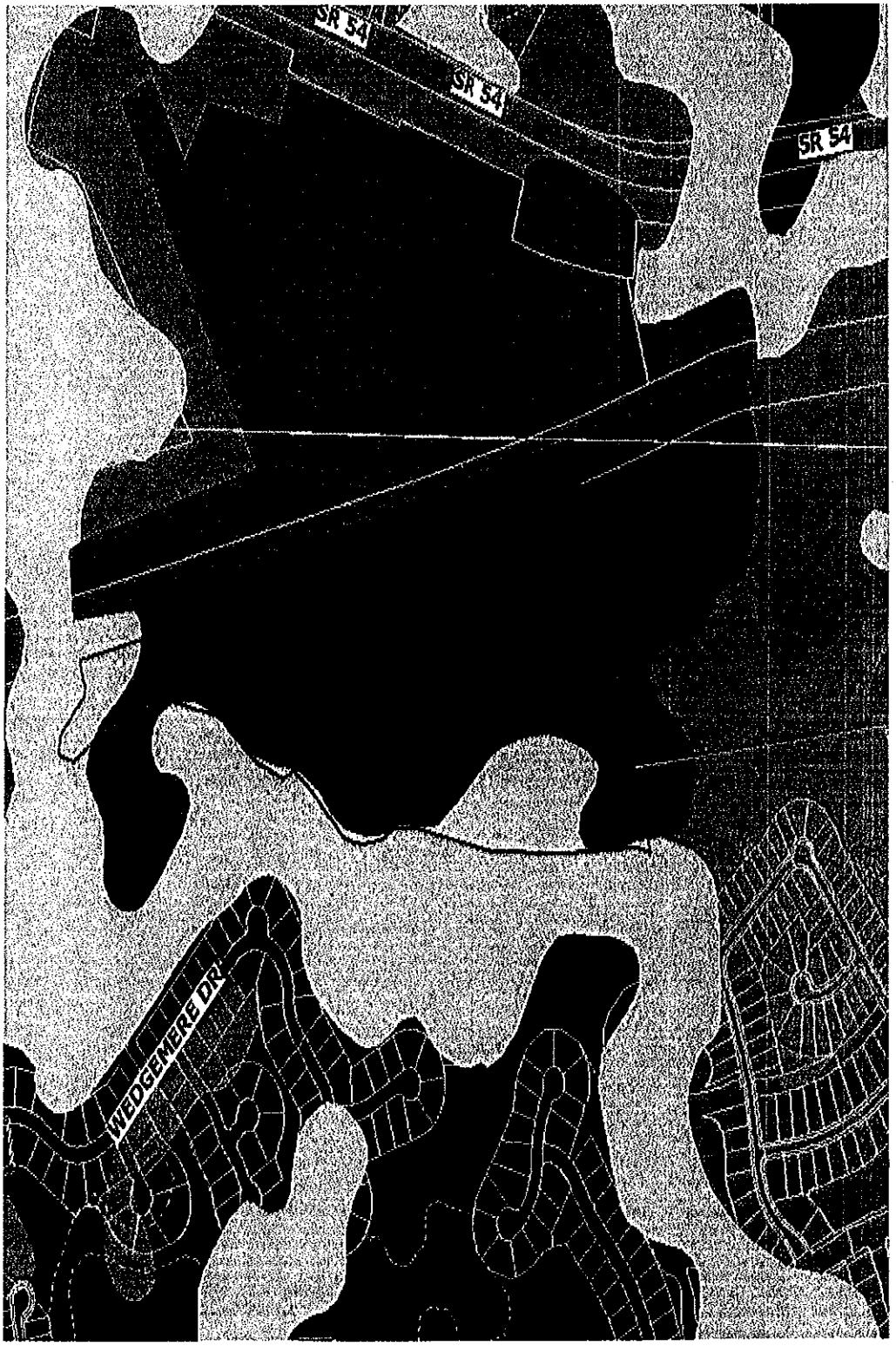
PROPOSED FIRE STATION #15
TRINITY BLVD.
ODESSA, FLORIDA

SITE TOPOGRAPHIC MAP

DRAWN BY:	J.C.	DATE:	AUG. 30, 2005	CHECKED BY:	E.J.G.	DATE:	AUG. 30, 2005
SCALE:	NOT TO SCALE	PROJECT NO:	80730-005-01	REPORT NO:		APPENDIX:	A



Legend

Soil Types

- Basinger fine sand: depressional
- Myakka fine sand
- Basinger fine sand
- Pomona fine sand
- Sellers mucky loamy fine sand
- Smyrna fine sand
- Quartzipsamments: shaped: 0 to 5 percent slopes

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PROPOSED FIRE STATION #15
TRINITY BLVD.
ODESSA, FLORIDA

SCS SOIL SURVEY MAP

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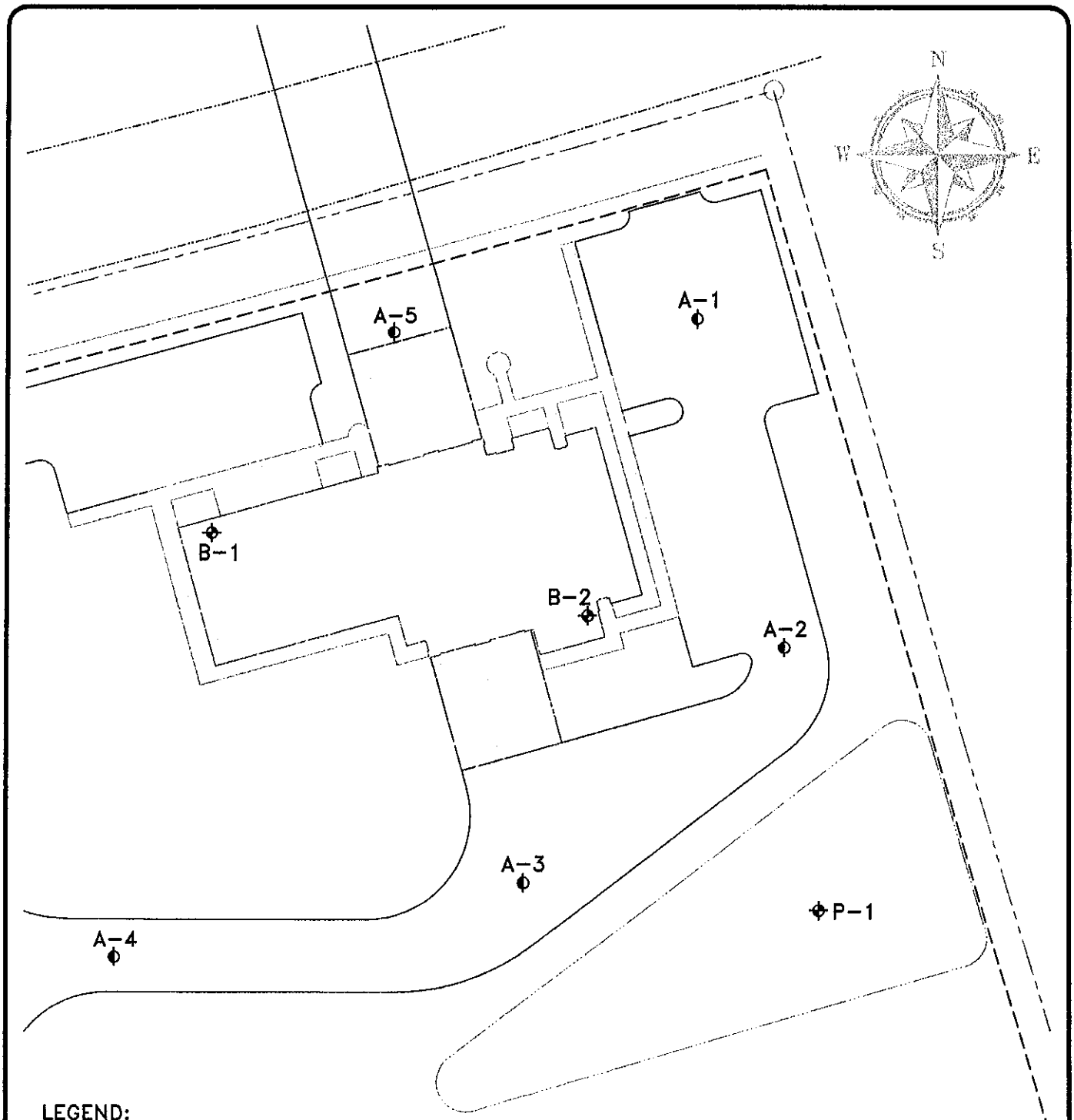
SCALE:	NOT TO SCALE	PROJECT NO:	80730-005-01	REPORT NO:		APPENDIX:	A

APPENDIX B



LEGEND:

- A-1 Approximate Auger boring location
- B-1 Approximate SPT boring location
- P-1 Approximate SPT pond boring location

GRAPHIC SCALE

0 25 50

(IN FEET)

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PROPOSED FIRE STATION #15
TRINITY BLVD.
ODESSA, FLORIDA

BORING LOCATION PLAN

DRAWN BY:	J.C.	DATE:	AUG. 30, 2005	CHECKED BY:	E.J.G.	DATE:	AUG. 30, 2005
SCALE:	1" = 50'	PROJECT NO:	80730-005-01	REPORT NO:		APPENDIX:	B

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	80730-005-01
REPORT NO.:	
PAGE:	1

PROJECT: Proposed Fire Station #15
Trinity Blvd.
Odessa, Florida

BORING DESIGNATION: **A-1** SHEET: **1 of 1**
SECTION: 32 TOWNSHIP: 26 S RANGE: 17 E

CLIENT: Spring Engineering, Inc.

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 4.0
DATE OF READING: 8/26/2005
EST. W.S.W.T. (ft): 2.0

DATE STARTED: 8/26/05
DATE FINISHED: 8/26/05
DRILLED BY: L.P.
TYPE OF SAMPLING: AUGER

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0				▽		Dark gray silty sand (SM) w/trace roots						
						Brown silty sand (SM)						
				▼								
5						Boring terminated at 6 feet.						
10												

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	80730-005-01
REPORT NO.:	
PAGE:	2

PROJECT: Proposed Fire Station #15
Trinity Blvd.
Odessa, Florida

CLIENT: Spring Engineering, Inc.

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

BORING DESIGNATION: **A-2** SHEET: **1 of 1**
SECTION: 32 TOWNSHIP: 26 S RANGE: 17 E

G.S. ELEVATION (ft):
WATER TABLE (ft): 4.0
DATE OF READING: 8/26/2005
EST. W.S.W.T. (ft): 2.0

DATE STARTED: 8/26/05
DATE FINISHED: 8/26/05
DRILLED BY: L.P.
TYPE OF SAMPLING: AUGER

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0				▽		Dark gray silty sand (SM) w/trace roots						
						Brown silty sand (SM)						
5				▼								
						Boring terminated at 6 feet.						
10												

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	80730-005-01
REPORT NO.:	
PAGE:	3

PROJECT: Proposed Fire Station #15
Trinity Blvd.
Odessa, Florida

CLIENT: Spring Engineering, Inc.

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

BORING DESIGNATION: **A-3** SHEET: **1 of 1**
SECTION: 32 TOWNSHIP: 26 S RANGE: 17 E

G.S. ELEVATION (ft):
WATER TABLE (ft): 4.0
DATE OF READING: 8/26/2005
EST. W.S.W.T. (ft): 2.0

DATE STARTED: 8/26/05
DATE FINISHED: 8/26/05
DRILLED BY: L.P.
TYPE OF SAMPLING: AUGER

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0						Gray silty sand (SM) w/trace roots						
				▽		Brown silty sand (SM)						
5				▼								
						Boring terminated at 6 feet.						
10												

BORING_LOG BORE LOGS.GPJ UNIENGSC.GDT 9/12/05

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	80730-005-01
REPORT NO.:	
PAGE:	4

PROJECT: Proposed Fire Station #15
Trinity Blvd.
Odessa, Florida

BORING DESIGNATION: **A-4** SHEET: **1 of 1**
SECTION: 32 TOWNSHIP: 26 S RANGE: 17 E

CLIENT: Spring Engineering, Inc.

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 4.0
DATE OF READING: 8/26/2005
EST. W.S.W.T. (ft): 2.0

DATE STARTED: 8/26/05
DATE FINISHED: 8/26/05
DRILLED BY: L.P.
TYPE OF SAMPLING: AUGER

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0				▽		Dark gray silty sand (SM) w/trace roots						
						Brown silty sand (SM)						
				▼								
5						Boring terminated at 6 feet.						
10												

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	80730-005-01
REPORT NO.:	
PAGE:	5

PROJECT: Proposed Fire Station #15
Trinity Blvd.
Odessa, Florida

CLIENT: Spring Engineering, Inc.

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

BORING DESIGNATION: **A-5** SHEET: **1 of 1**
SECTION: 32 TOWNSHIP: 26 S RANGE: 17 E

G.S. ELEVATION (ft):
WATER TABLE (ft): 4.0
DATE OF READING: 8/26/2005
EST. W.S.W.T. (ft): 2.0

DATE STARTED: 8/26/05
DATE FINISHED: 8/26/05
DRILLED BY: L.P.
TYPE OF SAMPLING: AUGER

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0				▽		Dark gray silty sand (SM) w/trace roots						
						Brown silty sand (SM)						
				▼								
5						Boring terminated at 6 feet.						
10												

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	80730-005-01
REPORT NO.:	
PAGE:	6

PROJECT: Proposed Fire Station #15
Trinity Blvd.
Odessa, Florida

CLIENT: Spring Engineering, Inc.

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

BORING DESIGNATION: **B-1** SHEET: **1 of 1**
SECTION: 32 TOWNSHIP: 26 S RANGE: 17 E

G.S. ELEVATION (ft):
WATER TABLE (ft): 3.8
DATE OF READING: 8/26/2005
EST. W.S.W.T. (ft): 2.0

DATE STARTED: 8/26/05
DATE FINISHED: 8/26/05
DRILLED BY: L.P.
TYPE OF SAMPLING: SPT

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0						Gray silty sand (SM) w/trace roots						
		1-2-2-2	4	▽								
						Mixed brown & light brown silty sand (SM) w/trace roots						
		2-4-5-5	9	▼								
5						Light brown sand w/silt (SP-SM)						
		4-4-4-4	8									
						Gray-brown clayey sand (SC)						
		2-4-4-6	8									
10		2-4-7-8	11									
						Tan weathered LIMESTONE w/trace clay						
15		1-3-50/3"	53/9"									
						Light gray silty, highly weathered LIMESTONE						
20		2-3-5	8									
						Tan weathered LIMESTONE w/trace clay						
25		12-18-21	39									
						Boring terminated at 25 feet.						

BORING_LOG BORE LOGS.GPJ UNIENGSC.GDT 9/12/05

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	80730-005-01
REPORT NO.:	
PAGE:	7

PROJECT: Proposed Fire Station #15
Trinity Blvd.
Odessa, Florida

CLIENT: Spring Engineering, Inc.

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

BORING DESIGNATION: **B-2** SHEET: **1 of 1**
SECTION: 32 TOWNSHIP: 26 S RANGE: 17 E

G.S. ELEVATION (ft):
WATER TABLE (ft): 3.0
DATE OF READING: 8/26/2005
EST. W.S.W.T. (ft): 2.0

DATE STARTED: 8/26/05
DATE FINISHED: 8/26/05
DRILLED BY: L.P.
TYPE OF SAMPLING: SPT

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0						Gray silty sand (SM) w/trace roots						
		1-1-2	3	▽								
				▼		Mixed brown & light brown silty sand (SM) w/trace roots						
		4-5-6-5	11			Light brown sand w/silt (SP-SM)						
5		4-6-7-8	13									
		6-8-9-10	17			Gray-brown clayey sand (SC)						
10		7-8-9-10	17									
						Light gray silty, highly weathered LIMESTONE						
15		1-2-2	4									
						Tan weathered LIMESTONE w/trace clay						
20		12-25-19	44									
						Tan weathered LIMESTONE w/trace calcareous clay						
		25-50/5"	50/5"									
25						Boring terminated at 25 feet.						

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	80730-005-01
REPORT NO.:	
PAGE:	8

PROJECT: Proposed Fire Station #15
Trinity Blvd.
Odessa, Florida

CLIENT: Spring Engineering, Inc.

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

BORING DESIGNATION: **P-1** SHEET: **1 of 1**
SECTION: 32 TOWNSHIP: 26 S RANGE: 17 E

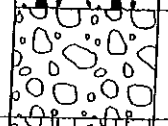
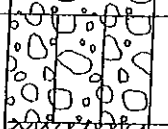
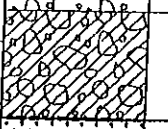
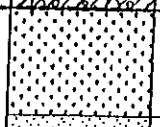
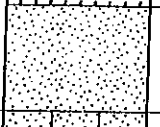
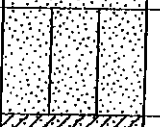
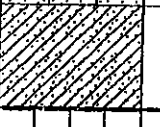
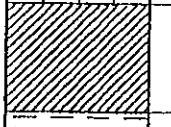
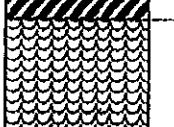
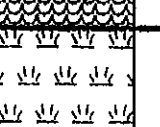
G.S. ELEVATION (ft):
WATER TABLE (ft): 2.9
DATE OF READING: 8/26/2005
EST. W.S.W.T. (ft): 2.0

DATE STARTED: 8/26/05
DATE FINISHED: 8/26/05
DRILLED BY: L.P.
TYPE OF SAMPLING: SPT

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0						Dark gray silty sand (SM) w/trace roots						
		1-1-2-2	3	▽								
				▼		Dark brown silty sand (SM)						
		2-2-2-2-	4									
5						Light gray-brown sand w/silt (SP-SM)						
		4-5-7-7	12									
		4-5-6-6	11									
10		7-8-9-9	17									
						Light brown sand w/clay (SP-SC)						
15		1-2-2	4			Boring terminated at 15 feet.						

BORING_LOG BORELOGS.GPJ UNIENGSC.GDT 9/12/05

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE			GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

APPENDIX C

CONSTRAINTS AND RESTRICTIONS

WARRANTY

Universal Engineering Sciences has prepared this report for our client for his exclusive use, in accordance with generally accepted soil and foundation engineering practices, and makes no other warranty either expressed or implied as to the professional advice provided in the report.

UNANTICIPATED SOIL CONDITIONS

The analysis and recommendations submitted in this report are based upon the data obtained from soil borings performed at the locations indicated on the Boring Location Plan. This report does not reflect any variations which may occur between these borings.

The nature and extent of variations between borings may not become known until construction begins. If variations appear, we may have to re-evaluate our recommendations after performing on-site observations and noting the characteristics of any variations.

CHANGED CONDITIONS

We recommend that the specifications for the project require that the contractor immediately notify Universal Engineering Sciences, as well as the owner, when subsurface conditions are encountered that are different from those present in this report.

No claim by the contractor for any conditions differing from those anticipated in the plans, specifications, and those found in this report, should be allowed unless the contractor notifies the owner and Universal Engineering Sciences of such changed conditions. Further, we recommend that all foundation work and site improvements be observed by a representative of Universal Engineering Sciences to monitor field conditions and changes, to verify design assumptions and to evaluate and recommend any appropriate modifications to this report.

MISINTERPRETATION OF SOIL ENGINEERING REPORT

Universal Engineering Sciences is responsible for the conclusions and opinions contained within this report based upon the data relating only to the specific project and location discussed herein. If the conclusions or recommendations based upon the data presented are made by others, those conclusions or recommendations are not the responsibility of Universal Engineering Sciences.

CHANGED STRUCTURE OR LOCATION

This report was prepared in order to aid in the evaluation of this project and to assist the architect or engineer in the design of this project. If any changes in the design or location of the structure as outlined in this report are planned, or if any structures are included or added that are not discussed in the report, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions modified or approved by Universal Engineering Sciences.

USE OF REPORT BY BIDDERS

Bidders who are examining the report prior to submission of a bid are cautioned that this report was prepared as an aid to the designers of the project and it may affect actual construction operations.

Bidders are urged to make their own soil borings, test pits, test caissons or other explorations to determine those conditions that may affect construction operations. Universal Engineering Sciences cannot be responsible for any interpretations made from this report or the attached boring logs with regard to their adequacy in reflecting subsurface conditions which will affect construction operations.

STRATA CHANGES

Strata changes are indicated by a definite line on the boring logs which accompany this report. However, the actual change in the ground may be more gradual. Where changes occur between soil samples, the location of the change must necessarily be estimated using all available information and may not be shown at the exact depth.

OBSERVATIONS DURING DRILLING

Attempts are made to detect and/or identify occurrences during drilling and sampling, such as: water level, boulders, zones of lost circulation, relative ease or resistance to drilling progress, unusual sample recovery, variation of driving resistance, obstructions, etc.; however, lack of mention does not preclude their presence.

WATER LEVELS

Water level readings have been made in the drill holes during drilling and they indicate normally occurring conditions. Water levels may not have been stabilized at the last reading. This data has been reviewed and interpretations made in this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, tides, and other factors not evident at the time measurements were made and reported. Since the probability of such variations is anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based upon such assumptions of variations.

LOCATION OF BURIED OBJECTS

All users of this report are cautioned that there was no requirement for Universal Engineering Sciences to attempt to locate any man-made buried objects during the course of this exploration and that no attempt was made by Universal Engineering Sciences to locate any such buried objects. Universal Engineering Sciences cannot be responsible for any buried man-made objects which are subsequently encountered during construction that are not discussed within the text of this report.

TIME

This report reflects the soil conditions at the time of exploration. If the report is not used in a reasonable amount of time, significant changes to the site may occur and additional reviews may be required.

SECTION 02100 - SITE PREPARATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. The work outlined in this section consists of all work required to prepare the site, the walkway areas and the roadway for grading. It includes clearing, grubbing and protection of trees. (This section relates to all alternates as well as the Base Bids.)

1.03 PROTECTION

A. Reference Points: Protect and maintain all bench marks on the site for reference points. Replace those disturbed or destroyed. If found at variance with the drawings, notify the Engineer before proceeding with Layout work.

1. Establish and maintain two corresponding benchmarks on the site for reference. All vertical dimensions shall be checked from these benchmarks. Location of these benchmarks with elevation data shall be provided to the Engineer immediately following setting.

B. Existing Trees to Remain: Trees designated to be retained shall be protected throughout the period of construction.

1. Low-hanging branches on trees to be retained shall not be cut without permission of the Engineer. All cuts or accidental injuries to the bark or trunk shall be immediately cleaned, trimmed and painted with protective tree wound and sealing compound. Contractor shall be responsible, in his base bid, for trimming the trees immediately south of the proposed structure in the event they interfere with roof construction or installation.

1.04 BARRICADES

A. The Contractor shall provide and maintain at his expense all necessary barricades, red lights, torches, reflectors and other danger signs and signals, provide watchmen where required and take all of the necessary precautions for the protection of the

work and safety of the public. Warning signs shall be erected at the work and on intersecting streets and other roadways, and such signs shall be properly illuminated at night.

B. Temporary barricades shall be erected and shall remain in place until the completion of the contract work.

1.05 TRAFFIC MAINTENANCE AND SERVICE

A. The Contractor shall arrange his work so as to cause a minimum of disturbance to normal vehicular traffic. Adequate and safe means of access to all portions of the property during all stages of construction shall be provided.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 INSTALLATION

A. Layout of Work: The Contractor shall be totally responsible for any and all surveying and field layout as may be required for complete installation and construction of site development as shown on the contract drawings. Prior to commencing grading operations, the Contractor shall stake out all proposed work to define limits of new construction. All surveying and layout work shall be done under the supervision of a registered land surveyor whose services shall be paid for by the Contractor.

1. Stake site improvements relative to reference lines, easements, and right-of way.

2. The Contractor shall then mark the clearing perimeter. Clearing shall not commence until the Engineer has approved these limits.

3.02 CLEARING

A. Unless otherwise shown on the plans or specified herein, all trees shall be removed when they are located within the construction limits.

B. Remove all downed timber, logs, snags, brush and rubbish from the site.

C. Clear site of broken concrete, stones, bricks, glass and debris, existing structures, and haul away from site.

D. All clearing shall be completed before grading operation begins. Loose sticks, roots, branches and debris shall not be left on the site.

E. Clearing and grubbing shall be performed in advance of grading operations.

3.03 DISPOSAL

A. All materials removed shall be disposed of at locations approved by the Engineer.

3.04 GRUBBING

A. In site cut and fill areas and in roadway areas, remove trees, shrubs, tree root systems and shrub root systems, all vegetable matter, subject to rot down to a depth of 12".

3.05 TOPSOIL

A. Remove topsoil to its entire depth within the limits of construction.

B. Areas to be stripped shall first be scraped clean of all brush, weeds, grass, roots, wood, glass, stones, broken concrete, brick and concrete block. Topsoil shall be free from subsoil, debris, and stones larger than 2 inches in diameter.

C. Enough topsoil shall be stockpiled to allow the spreading of the material to a depth of not less than two inches over the entire area where existing grade is changed and where the application of topsoil is possible. Topsoil shall be stockpiled in on-site locations where it will not interfere with paving construction, site or utility operations. Materials stockpiled shall be placed in a manner to afford drainage. Protect against erosion using bales of hay or filter fence placed continuously around perimeter.

3.06 WATER REMOVAL

A. Remove surface and subsurface water from areas of work. Provide and maintain sufficient pumps, well points, sumps, suction and discharge lines and other dewatering systems, techniques, and components necessary to convey water from the areas of work.

END OF SECTION 02100

SECTION 02220 - EXCAVATING, FILLING AND GRADING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Furnish all labor, materials and equipment necessary to perform the work specified.

B. Provide filling and backfilling to attain indicated grades.

C. Perform trenching and trench backfilling.

D. Perform rough and finish grading of the site.

PART 2 - PRODUCTS

2.01 FILL MATERIAL, GENERAL

A. Approval Required: All fill material shall be subject to the approval of the Engineer.

B. Notification: For approval of fill material, notify the Engineer at least five (5) working days in advance of intention to import material, designate the proposed borrow area, and permit the Engineer to sample as necessary from the borrow area for the purpose of making acceptance tests to prove the quality of the material.

2.02 IMPORTED FILL MATERIAL

A. All imported fill material shall be soil or soil-rock mixture which is free from organic matter and other deleterious substance and, in addition, shall be predominantly granular with a maximum particle size of two inches and a plasticity index of 12 or less.

2.03 TRENCH BACKFILL

A. Fill material used for trench backfill shall meet the requirements of Article 2.02 above.

B. Imported cohesionless material used for trench backfill shall be free from organic substance and other deleterious matter, shall be subject to the approval of the Engineer, and shall be in particle size grading within the following limits:

Passing the number four sieve:	100%
Passing the number 200 sieve:	3% maximum

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation, shall be as selected by the Contractor subject to the approval of the Engineer.

PART 3 - EXECUTION

3.01 GENERAL

A. Familiarization: Prior to all work of this Section, become thoroughly familiar with the site, the site conditions, and all portions of the Work falling within this Section. Do not submit a bid on this project without performing a thorough reconnaissance of the project site and existing conditions.

B. Backfilling Prior to Approvals:

1. Do not allow or cause any of the work performed or installed to be covered up or enclosed by work of this Section prior to all required inspections, tests and approvals.

2. Should any of the work be so enclosed or covered up before it has been approved, uncover all such work at no additional cost to the Owner.

3. After the work has been completely tested, inspected, and approved, make all repairs and replacements necessary to restore the work to the

condition in which it was found at the time of uncovering, all at no additional cost to the Owner.

3.02 FINISH ELEVATIONS AND LINES

A. For setting and establishing finish elevations and lines, secure the services of a Florida registered land surveyor acceptable to the Engineer. Carefully preserve all data and monuments set, and, if displaced or lost, immediately replace to the approval of the Engineer at no additional cost to the Owner.

3.03 EXCAVATING

A. Depressions: Where depressions result from, or have resulted from, the removal of surface or sub-surface obstructions, open the depression to equipment working width and remove all debris and soft material as directed by the Engineer.

B. Other Areas: Excavate to grades shown on the Drawings. Where excavation grades are not shown on the Drawings, excavate as required to accommodate the installation.

C. Where muck, rock, clay or other material within the limits of construction is, in the opinion of the Architect/Engineer, unsuitable in its original position, the Contractor shall excavate such material and backfill with suitable material which shall be shaped to conform to the required section.

D. Over excavation: Backfill and compact all over-excavated areas as specified for fill below, and at no additional cost to the Owner.

3.04 PREPARATION OF SUBGRADE

A. Scarifying: After the site has been cleared, stripped, and excavated to within six inches of the specified depths for recompaction, scarify the exposed surface to a minimum depth of six inches, thoroughly moisture-condition, and compact to the requirements specified for fill below.

B. Leveling: Remove all ruts, hummocks, and other uneven surfaces by surface grading prior to placement of fill.

3.05 EXCESS WATER CONTROL

A. Unfavorable Weather: Do not place, spread, or roll and fill material during

unfavorable weather conditions. Do not resume operations until moisture content and fill density are satisfactory to the Engineer.

B. Flooding: Provide berms or channels to prevent flooding of subgrade. Promptly remove all water collecting in depressions.

C. Softened Subgrade: Where soil has been softened or eroded by flooding or placement during unfavorable weather, remove all damaged areas and recompact as specified for fill and compaction below.

D. Dewatering:

1. Provide and maintain at all times during construction, ample means and devices with which to remove promptly and dispose of all water from every source entering the excavations or other parts of the Work.

2. Dewater by means which will ensure dry excavations and the preservation of the final lines and grades of bottoms of excavations.

3. Dewatering operations shall not discharge into any storm sewers.

3.06 FILL AND COMPACTION

A. Existing subgrade to be compacted as outlined in the geotechnical report dated October 24, 1991 prepared by Atlantic Testing and Engineering.

B. Filling: After subgrade compaction has been approved by the Engineer, spread approved fill material in layers not exceeding eight inches in uncompacted thickness.

C. Moisture-conditioning: Water or aerate the fill material as necessary, and thoroughly mix to obtain a moisture content which will permit proper compaction.

D. Compaction, General: Compact each soil layer to at least the specified minimum degree. Repeat compaction process until plan grade is attained.

E. Degree of Compaction Requirements:

1. Pavement Areas: Compact the upper six inches of fill in pavement areas to a minimum degree of compaction of 98% in accordance with AASHTO T-180 if stabilization is provided, or 100% in accordance with AASHTO T-99

for 12" depth per Florida Department of Transportation (FDOT) Specifications.

2. Trenches in Pavement Areas:

a) Pavement areas are defined, for the purpose of this paragraph, as extending a minimum of five feet beyond the pavement.

b) Compact cohesive backfill material to a minimum degree of compaction of 95%.

c) Compact the upper six inches of backfill in pavement areas to a minimum degree of 98% in accordance with AASHTO T-180 for 8" min. depth if stabilization is provided, or 100% in accordance with AASHTO T-99 for 12" depth per Florida Department of Transportation (FDOT) Specifications.

d) Densify cohesionless backfill material to a minimum relative density of 95%.

e) Compact materials of a questionable cohesion to either a minimum degree of compaction to 98% in accordance with AASHTO T-180 for 8" min. depth if stabilization is provided, or 100% in accordance with AASHTO T-99 for 12" depth per Florida Department of Transportation (FDOT) Specifications.

F. Jetting will not be permitted unless specifically authorized by the Engineer for densification of cohesionless materials.

3.07 GRADING

A. General: Except as otherwise directed by the Engineer, perform all rough and finish grading required to attain the elevations shown on the Drawings.

B. Grading Tolerances:

1. Rough Grade:

Road Areas: Plus or minus 0.1 foot

2. Finish Grade:

Paved Areas: (See Section 02500)

C. Treatment After Completion of Grading:

1. After grading is completed and the Engineer has finished his inspection, permit no further excavating, filling or grading except with the approval of and inspection by the Engineer.

2. Use all means necessary to prevent erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

3.08 TRENCHING

A. General:

1. Perform all trenching required for the installation of items where the trenching is not specifically described in other Sections of these Specifications.

2. Make all trenches open vertical construction with sufficient width to provide free working space at both sides of the trench and around the installed item as required for caulking, joining, backfilling and compacting.

B. Depth: Trench as required to provide the elevations shown on the Drawings. Where elevations are not shown on the Drawings, trench to sufficient depth to give a minimum of 36 inches of fill above the top of the pipe, measured from the adjacent finished grade.

C. Correction of Faulty Grades: Where trench excavation is inadvertently carried below proper elevations, backfill with material approved by the Engineer, and then compact to provide a firm and unyielding subgrade to the approval of the Engineer and at no additional cost to the Owner.

D. Trench Bracing:

1. Properly support all trenches in strict accordance with all pertinent rules and regulations.

2. Brace, sheet, and support trench walls in such a manner that they will be safe and that the ground alongside the excavation will not slide or settle, and that all existing improvements of every kind, whether on public or private property, will be fully protected from damage.

3. In the event of damage to such improvements, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

4. Arrange bracing, sheeting and shoring so as to not place stress on any portion of the completed Work until the general construction thereof has proceeded far enough to provide sufficient strength.

E. Removal of Trench Bracing: Exercise care in the drawing and removal of sheeting, shoring, bracing and timbering to prevent collapse and caving of the excavation faces being supported.

F. Grading and Stockpiling Trenched Material: Control the stockpiling of trenched material in a manner to prevent water running into the excavations. Do not obstruct surface drainage, but provide means whereby storm and waste waters are diverted into existing gutters, other surface drains, or temporary drains.

3.09 FOUNDATION FOR PIPES

A. General: Grade the trench bottoms to provide a smooth, firm, and stable foundation free from rock points throughout the length of the pipe.

B. Foundation Material: Place a minimum of six inches of the specified cohesionless material in the bottom of the trench

C. Subsurface Conditions:

1. In areas where soft, unstable materials are encountered at the surface upon which cohesionless material is to be placed, remove the unstable material and

replace it with material approved by the Engineer. Make sufficient depth to develop a firm foundation for the item being installed.

2. If the need for such Over excavation has been occasioned by an act or failure to act on the part of the Contractor, make the Over excavation and replacement at no additional cost to the Owner.

D. Shaping:

1. At each joint in the pipe, recess the bottom of the trench as required into the firm foundation in such a manner as to relieve the bell of the pipe of all load and to ensure continuous bearing of the pipe barrel on the firm foundation.

2. Accurately shape all pipe subgrade and fit the bottom of the trench to the pipe shape. Use a drag template shaped to conform to the outer surface of the pipe if other methods do not produce satisfactory results.

3.10 BEDDING FOR PIPES

A. General: Place the specified cohesionless material in the trench, simultaneously on each side of the pipe for the full width of the trench, to a maximum depth of three feet and a minimum depth of one foot above the outside diameter of the pipe barrel.

B. Densification:

1. Densify the bedding material after placing by thoroughly saturating with water and vibrating with jetting equipment and a concrete vibrator stinger, at maximum intervals of two feet along both sides of the pipe.

2. Take special care to provide firm bedding support on the underside of the pipe and fittings for the full length of the pipe.

C. Alternate Bedding: Other bedding procedures and materials may be used if prior written approval has been obtained from the Engineer.

3.11 BACKFILL FOR PIPES

A. Using On-Site Materials: After the pipe has been thoroughly bedded and covered, spread the on-site material in uniform lifts of not more than eight inches in uncompacted thickness, and then compact as specified in this section. Repeat the spreading and compacting procedure until adjacent grade level is attained.

B. Using Imported Cohesionless Material: After the pipe has been thoroughly bedded and covered, fill the remaining portion of the trench with the specified cohesionless material, and densify as specified in this Section.

END OF SECTION 02220

SECTION 02270 - EROSION, SEDIMENTATION AND DUST CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This work shall consist of control measures as specified or as shown on the plans during the life of the contract to control erosion, sedimentation and dust.

B. Establish, construct and maintain erosion, sediment and siltation control measures in accordance with local and state water management districts in order to prevent any and all siltation from leaving the site. The erosion control plans shall be maintained during the entire period of construction. The Contractor, with the advice and consultation of the Engineer, shall endeavor to stop all sediment and erosion.

C. The erosion control features installed shall be effectively maintained by the Contractor.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 SILTATION BARRIERS

A. Silt barriers shall be constructed by the Contractor and maintained throughout construction. Sediment accumulated behind silt barriers shall be removed when the ponding capacity is reduced by one-half. Silt barriers shall be erected along the south and east boundaries of the project.

3.02 DUST CONTROL

A. Exercise precautionary measures to minimize dust emissions which will include, but shall not be limited to, periodic sprinkling or wetting of the site.

END OF SECTION 02270

SECTION 02281 - TERMITE CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Soil treatment for termite control below grade.

1.02 REFERENCES

A. EPA - Environmental Protection Agency - Federal Insecticide, Fungicide and Rodenticide Act.

1.03 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Indicate each toxicant to be used, composition by percentage, dilution schedule, intended application rate.

C. Test Reports: Indicate regulatory agency approval reports when required.

D. Manufacturer's Certificate: Certify that toxicants meet or exceed specified requirements.

1.04 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700.

B. Accurately record moisture content of soil before application, date and rate of application areas of application, diary of meter readings and corresponding soil coverage.

1.05 MAINTENANCE DATA

A. Submit under provisions of Section 01700.

B. Maintenance Data: Indicate re-treatment schedule.

1.06 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with minimum three (3) years documented experience approved by manufacturer and licensed by the State of Florida.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for requirements for application, authority to use toxicant chemicals in accordance with EPA.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of toxicants.

1.08 SEQUENCING

A. Sequence work under the provisions of Section 01010.

B. Apply toxicant immediately prior to installation of vapor barrier under slabs-on-grade.

1.09 WARRANTY

A. Provide five (5) year warranty under provisions of Section 01700.

B. Warranty: Include coverage for damage and repairs to building and building contents caused by termites. Repair damage. Re-treat where required.

C. Inspect and report annually to Owner in writing.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Toxicant Chemical: EPA and local authority approved; synthetically color dyed to permit visual identification of treated soil. Provide a working solution of Dursban TC. Other solutions may be used as recommended by the Applicator and if acceptable to the Architect and local governing authorities. Use only soil treatment solutions which are not injurious to plantings.

B. Diluent: Water.

2.02 MIX

A. Mix toxicant to manufacturer's recommended concentration.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that soil surfaces are sufficiently dry to absorb toxicant, and ready to receive treatment.

B. Verify final grading is complete.

3.02 APPLICATION

A. Spray apply toxicant in accordance with manufacturer's instructions.

B. Apply toxicant at locations indicated in Schedule at end of Section.

C. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.

D. Re-treat disturbed treated soil with same toxicant as original treatment.

E. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.03 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.

B. Post signs in areas of application warning workers that soil poisoning has been applied. Remove signs when areas are covered by other construction.

3.04 SCHEDULES

A. Locations:

1. Under Slabs-on-Grade.

2. Both sides of foundation surface, exterior and interior continuous wall footings, and column pads.

END OF SECTION 02281

SECTION 02500 - ASPHALT PAVING AND SURFACING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Furnish all labor, materials and equipment necessary to perform the work as specified and in the locations shown on the drawings.

B. Grades shall be established and maintained by the Contractor. In establishing the grades, due allowances shall be made for existing improvements, proper drainage, and adjoining property rights.

C. Paving work shall not begin until underground work of other trades has been completed, curbs installed and frames of subsurface structures installed at designated elevations.

1.03 QUALITY ASSURANCE

A. Industry standards as follows shall apply to this work except as otherwise shown on the drawings.

1. Green Book, 1996 Edition

2. "Standard Specifications for Construction of Roads and Bridges", Department of Transportation, State of Florida, 2000 Edition.

3. Flexible Pavement Design Manual

4. Manual of Florida Sampling and Testing Methods, latest Edition

B. Testing: Testing shall be performed by a qualified independent testing laboratory acceptable to the Engineer. Test results shall be sent directly from the testing lab to the Engineer. Testing requirements as indicated on the drawings.

1. All tests required under this section shall be paid for by the Contractor. Results of the tests shall be forwarded in report form directly to the Engineer. All paving disturbed as a result of corings shall be replaced and repaired by the Contractor at his expense.

1.04 WEATHER LIMITATIONS

A. Apply prime and tack coats only when ambient temperature is above 50 degrees F., and when temperature has not been below 35 degrees 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 only when atmospheric temperature is above 40 degrees, F., and when base is dry. Base course may be placed when air temperature is above 30 degrees F. and rising.

1.05 SUBMITTALS

A. Submittals shall be made for each of the following items:

1. Mix design and site conformation from plant providing asphalt.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Limerock Base: All limerock in the Work will conform to the Florida Department of Transportation "Standard Specifications for Road and Bridge Construction", Section 911. Limerock material used shall have an LBR value of not less than 100.

B. Prime Coat: The material used for prime coat shall be cut-back asphalt, grade RC-70 or RC-250 meeting the requirements of Section 916-2 or emulsified asphalt grade RS-2 of the "Standard Specifications for Road and Bridge Construction:, Florida Department of Transportation.

C. Asphalt Cement: Asphalt cement and bituminous materials shall be in conformance with Section 331 of the "Standard Specifications for Road and Bridges Construction", Florida Department of Transportation.

D. Asphalt Mix: Asphalt concrete shall be Type S-1.

E. Pavement Striping: FDOT Specification 971-12, non-reflective, painted traffic arrows - color: white.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Subgrade: Scarify all cut areas and areas to receive fill material to a minimum depth of 6 inches, and disc blade until materials is free of large clods. The scarified soil will then be moisture conditional to not less than 2 percent below optimum moisture content and then compacted and tested.

B. All boulders, organic materials, soft clay, spongy or yielding material shall be removed and replaced with material which will provide the specified compaction. All submerged stumps, roots or other perishable matter encountered in preparation of the subgrade shall be removed to a depth of not less than two feet below subgrade.

C. The subgrade shall be compacted to maximum density for a depth of eight inches (8").

D. After the subgrade has been compacted to the specified density, the area shall be fine graded to a tolerance of 0.1 foot from the grades shown or indicated on the drawings.

E. The paving contractor shall verify that the subgrades have been shaped to true line and elevations and that all drainage facilities and underground utilities are complete.

3.02 PAVING THICKNESS

A. In place compacted paving thickness shall be as follows on site:

a) 8 inches stabilized subgrade (LBR 40).
b) 10 inches limerock base.
c) 2 inch of Asphalt Cement Type S-I.

3.03 BASE COURSE

A. The limerock base shall be constructed in accordance with Florida DOT Standard Specifications for Roads and Bridges Section 200 or Section 270 respectively. All work shall conform to industry standards.

B. The stabilizing material shall be placed on the subgrade or sub-base in layers of

uniform thickness with an approved spreader. The spreader shall contain a hopper, an adjustable screed and be so designed that there will be a uniform, steady flow of material from the hopper. The spreader shall be capable of laying material without segregation across the full width of the lane to a uniform thickness and to a uniform loose density. Each compacted layer of material shall be 6" maximum, it shall be placed in two layers of equal thickness as required. The layers shall be placed so that when compacted, they will be true to the grades required with the least possible disturbance. Where the base course is constructed in more than one layer, the previously constructed layers shall be cleaned of loose and foreign matter by sweeping with power sweepers, power brooms, or hand brooms, as directed. The water content of the material shall be maintained during the placing period at the optimum percentage (+1-1/2%), as determined by AASHTO T-180 or AASHTO T-99, whichever is applicable. Such adjustments in placing procedures or equipment shall be made as may be directed to obtain true grades, to minimize segregation and degradation, to reduce or accelerate loss or gain of water, and to insure a satisfactory base course.

C. Dry placing and grading of the base shall be rolled with rollers capable of obtaining the specified density. The rolling shall continue until the base is compacted to a maximum laboratory dry density of 98% of AASHTO T-180. If requested by the Engineer, the Contractor shall verify the field density by AASHTO T-147 or ASTM D2167.

D. The surface of the base shall be finished by blading or with automated equipment especially designed for this purpose and rolling with a steel-wheeled roller. In no case shall thin layers of material be added to the top layer of the base course in order to meet the grade.

E. The surface of the complete base shall not show any deviation in excess of 1/4" when tested with a 10' straight edge. The completed thickness of the base shall be within 1/4" of the thickness indicated.

F. The base shall be maintained in a condition that will meet all specification requirements until the Work is accepted.

3.04 APPLICATION OF PRIME COAT

A. Apply prime coat (Grade RC-3000) over base at the rate of not less than 0.10 gallon per square yard.

3.05 APPLICATION OF SURFACE COURSE

A. The asphalt concrete surface shall be DOT Type S-I, as specified in Section 331 of Florida DOT "Standard Specifications for Road and Bridge Construction", 1991.

3.06 SPREADING SURFACE COURSE

A. Asphalt surface course shall be spread and struck off with a paver. Irregularities in the surface of the pavement course shall be corrected directly behind the paver. Excess material forming high spots shall be removed with a shovel or a lute. Indented areas shall be filled with hot mix and smoothed with a lute or the edge of a shovel being pulled over the surface. Casting a mix over such areas shall not be permitted.

3.07 RESTRICTED AREAS

A. In areas that restrict use of paver or spread box, the surface courses may be spread and finished by hand. Wood or steel forms, rigidly supported to assure correct grade and cross-section, may be used. Placing by hand shall be performed carefully to avoid segregation of the mix. Broadcasting of the material shall not be permitted. Any lumps that do not break down readily shall be removed.

3.08 COMPACTION OF SURFACE COURSE

A. The required density shall be attained before the plant mix reaches a temperature of 150 degrees F.

1. Rolling shall start as soon as the hot-mix material can be compacted without displacement; two rollers are required. Rolling shall continue until thoroughly compacted (and all roller marks have disappeared) to 97% of laboratory-compacted density. On areas too small for the roller, a vibrating pate compactor or hand tamper shall be used to achieve thorough compaction.

END OF SECTION 02500

SECTION 02528 - CONCRETE SIDEWALKS AND CURBS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION

A. Work Included: The furnishing and installation of concrete curbs and concrete sidewalks as indicated on Drawings and as herein specified.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete: Concrete for walks and curbs is indicated in this Section. Minimum 28-day compression strength of concrete shall be 3000 PSI, maximum slump 5 inches.

B. Forms: Wood or steel, straight of sufficient strength to resist springing during depositing and consolidating concrete, and height equal to the full depth of the finished sidewalk and curb.

C. Expansion Joint Filler: Asphalt-impregnated fiber strips 1/2" thick, unless otherwise shown on Drawings, Celotex Flexcell, or approved equal.

D. Reinforcing: Sidewalks shall be reinforced with 6x6 10/10 welded wire mesh unless noted otherwise.

PART 3 - EXECUTION

3.01 PREPARATION

A. Areas to receive concrete walks and curbs shall be graded and compacted as specified in Site Preparation, 02100.

3.02 INSTALLATION

A. Forms: Set with upper edge true to line and grade and shall be held rigidly in place by stakes placed at intervals not to exceed 4'-0". Forms shall be coated with oil or wetted each time before concrete is placed. Side forms shall not be removed for less than twelve (12) hours after finishing has been completed.

B. Expansion Joints: Transverse expansion joints shall be filled with 1/2" thick joint filler strips. Joint filler shall be placed with top edge 1/4" below the surface and shall be held in place with steel pins or other devices to prevent warping of filler during floating and finishing. Immediately after finishing operations are completed, joint edges shall be rounded with an edging tool and concrete over the joint fill shall be removed. At the end of the curing period, expansion joints shall be carefully cleaned and any material protruding above top of pavement shall be cut flush with pavement. Sealing of joints in sidewalks is not required. Provide expansion joints for each 20 linear ft. (min.) or each 400 square ft. (max.).

C. Placing Concrete: Place concrete in forms in one layer to thickness indi-cated. Use a strike-off guided by side forms to bring surface to proper section. Tamp and consolidate concrete. Finish with wood float and apply a brush finish across width of sidewalk using a medium hair brush. A 5" wide distinct smooth trowel finish shall be applied to all four (4) edges of each sidewalk section creating a "picture frame" effect. The finished surface shall not vary more than 3/16" in 10'-0", providing crown or slope in direction of flow of surface water. Verify finish with drawings.

D. Control Joints: Control joints for the sidewalk shall be tooled with a proper edging tool to a depth of 1/4 sidewalk thickness, not to exceed 5'-0" o.c.

END OF SECTION 02528

SECTION 02701 - SITE UTILITIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. All water and sewer improvements will conform with Pasco County Standards for design and construction of water and wastewater systems specifications.

1.02 SUMMARY

A. Provide all materials, labor, equipment and perform all operations in connection with the maintenance, support, protection, relocation, reconstruction and adjustment-to-grade, restoration and abandonment of existing utilities affected by the construction work of this project, as indicated on the Drawings and this Specification.

B. Related Work Specified Elsewhere:

1. Excavating, Filling and Grading - Section 02220.

2. Plumbing - Division 15.

3. Electrical - Division 16.

1.03 DEFINITION

A. For the purpose of this specification, utility is defined as any service, such as electric light and power systems; gas distribution systems; telephone cable; cable television and other communication systems; street lighting and traffic signs.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products and materials shall be as specified in the appropriate Divisions and Sections of these Specifications.

B. Materials:

1. Verify location and elevation of all existing utilities necessary for connection with this project prior to initiating any work.

2. Maintain on-site and have available for inspection by the Engineer a detailed record which includes signed vouchers and receipts of new materials received.

PART 3 - EXECUTION

3.01 GENERAL

A. Ensure continuity of all existing utility services to all users, except when temporary interruption has been approved a minimum of 48 hours in advance.

3.02 EXISTING FACILITIES

A. Where an existing utility facility is encountered which is not indicated, or which is determined to be a different utility than that indicated, promptly notify the Engineer who will assist in determining the owner of the facility.

B. Demolish and remove abandoned utility facilities in conflict with the Work.

END OF SECTION 02701

SECTION 02900 - LANDSCAPE WORK

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 work of this section.

1.02 SUMMARY

A. Extent of landscape development work is indicated on drawings and by provisions of this section.

B. Subgrade Elevations: Excavation, filling and grading required to establish elevations shown on drawings are not specified in this section. Refer to site work sections.

C. All landscaped and sodded areas damaged during the construction process shall be replaced. All disturbed grass areas shall be resodded with Bahia to the extent and limits as directed by the Architect.

D. Landscape subcontractor shall submit proof of having been in the landscaping business a minimum of three (3) years. Three (3) letters from previous clients with location, size and date of project area also a requirement of this project.

E. Sod all areas designated on site plan not slated for building, roadways or planted areas.

1.03 SUBMITTALS

A. Certification: Submit certificates of inspection as required by governmental authorities. Submit manufacturer's or vendor's certified analysis for soil amendments and fertilizer materials. Submit other data substantiating that materials comply with specified requirements.

1.04 QUALITY ASSURANCE

A. Source Quality Control: Ship landscape materials with certificates of inspection as required by governing authorities. Comply with regulations applicable to landscape materials.

1.05 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.

B. Sod: Time delivery so that sod will be placed within 24 hours after stripping. Protect sod against drying and breaking of rolled strips. Submit written proof from sod distributor of time and date of stripping.

1.06 PROJECT CONDITIONS

A. Proceed with and complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work required.

1.07 SPECIAL PROJECT WARRANTY

A. Warranty all sod and plant material for a period of one (1) year from date of final acceptance.

PART 2 -PRODUCTS

2.01 TOPSOIL

A. Topsoil will be stockpiled for re-use in landscape work. Quantity of stockpiled topsoil will be insufficient, provide additional topsoil as required to complete landscape work.

1. Use topsoil obtained from site.

2. Provide additional topsoil to complete project in all sodded and landscaped areas.

2.02 SOIL AMENDMENTS

A. Lime: Natural limestone containing not less than 85% of total carbonates, ground so that not less than 90% passes a 10-mesh sieve and not less than 50% passes a 100-mesh sieve.

B. Aluminum Sulfate: Commercial grade.

C. Peat Humus: Fed. Spec. Q-P-166 and with texture and ph range suitable for intended use.

D. Bonemeal: Commercial, raw, finely ground; 4% nitrogen and 20% phosphoric acid.

E. Superphosphate: Soluble mixture of treated minerals; 20% available phosphoric acid.

F. Sand: Clean, washed sand, free of toxic materials.

G. Perlite: Conforming to National Bureau of Standards PS 23.

H. Vermiculite: Horticultural grade, free of toxic substances.

I. Sawdust: Rotted sawdust, free of chips, stones, sticks, soil or toxic substances and with 7.5 lbs. nitrogen uniformly mixed into each cubic yard of sawdust.

J. Manure: Well rotted, unleached stable or cattle manure containing not more than 25% by volume of straw, sawdust or other bedding materials and containing no chemicals or ingredients harmful to plants.

K. Commercial Fertilizer: Complete fertilizer of neutral character, with some elements derived from organic sources and containing following percentages of available plant nutrients:

1. For grassed areas, provide fertilizer with not less than 4% phosphoric acid and not less than 2% potassium, and percentage of nitrogen required to provide not less than 1 lb. of actual nitrogen per 1000 sq. ft. of grassed area. Provide nitrogen in a form that will be available to grass during initial period of growth.

2.03 GRASS MATERIALS

A. Sod: Provide strongly rooted sod, not less than 2 years old and 95% free of weeds and undesirable native grasses and machine cut to pad thickness of 3/4" (+1/4"), excluding top growth and thatch. Provide only sod capable of vigorous growth and development when planted (viable, not dormant).

1. Provide sod of uniform pad sizes with maximum 5% deviation in either

length or width. Broken pads or pads with uneven ends will not be acceptable. Sod pads incapable of supporting their own weight when suspended vertically with a firm grasp on upper 10% of pad will be rejected.

2. Provide sod composed of Florida muck-grown Bahia.

2.04 MISCELLANEOUS LANDSCAPE MATERIALS

A. Filtration/Separation Fabric: Water permeable filtration fabric of fiberglass or polypropylene fabric.

B. Mulch: Provide clean, 100% clean pine bark mulch 3" deep around all new trees and in all new plant bed areas.

2.05 PLANT MATERIAL

All plant and tree material shall conform to the Standards for Florida No. 1 or better as given in Grades and Standards for Nursery Plants, Part I, 1963 and Part II, State of Florida Department of Agriculture, Tallahassee.

2.06 IRRIGATION SYSTEM

All new landscaped and sodded areas on this project are to be irrigated with a completely integrated commercial grade system. The Contractor is required to submit a proposed irrigation system layout to Spring Engineering, Inc. showing the complete layout to scale, zones, coverage and details. This must be submitted six (6) weeks prior to installation of landscaping. Irrigation controls to be ESP solid state controller with an indoor mountable cabinet or equal.

PART 3 - EXECUTION

3.01 PREPARATION FOR GRASSING WORK

A. Loosen subgrade of grassed areas to a minimum of 4". Remove stones over 1" in any dimension and sticks, roots, rubbish and other extraneous matter. Limit preparation to areas which will be planted promptly after preparation.

NOTE: Thoroughly rake all areas to remove debris prior to laying of sod.

1. Spread top soil to minimum depth required to meet lines, grades and

elevations shown, after light rolling and natural settlement. Add specified soil amendments and mix thoroughly into upper 4" of topsoil.

2. Place approximately 1/2 of total amount of top soil required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil. Add specified soil amendments and mix thoroughly into upper 4" of topsoil.

B. Preparation of Unchanged Grades: Where grassed areas are in areas that have not been altered or disturbed by excavating, grading, or stripping operations, prepare soil for grassed areas as follows: Till to a depth of not less than 6"; apply soil amendments and initial fertilizers as specified; remove high areas and fill in depressions; till soil to a homogenous mixture, free of lumps, clods, stones, roots, and other extraneous matter.

1. Prior to preparation of unchanged areas, remove existing grass, vegetation and turf. Dispose of such material outside of Owner's property; do not turn over into soil being prepared for sod.

2. Allow for sod thickness in areas to be sodded.

3. Apply specified commercial fertilizer at rates specified and thoroughly mix into upper 2" of topsoil. Delay application of fertilizer if grassing work will not follow within a few days.

C. Fine grade grassed areas to smooth, even surface with loose, uniformly fine texture. Roll, rake and drag grassed areas, remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas which can be planted immediately after grading.

D. Moisten prepared grass areas before commencing grassing work if soil is dry. Water thoroughly and allow surface moisture to dry before commencing grassing work. Do not create a muddy soil condition.

E. Restore grass areas to specified condition if eroded or otherwise disturbed after fine grading and prior to grassing.

3.02 SODDING

A. Time Limits and Extent of Sodding: Lay sod within 24 hours from time of stripping. Do not plant dormant sod.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass.

1. Anchor sod on slopes with wood pegs to prevent slippage.

C. Water sod thoroughly with a fine spray immediately after planting.

3.03 MAINTENANCE

A. Begin maintenance immediately after planting.

B. Maintain grassed areas for not less than the period stated below and longer as required.

1. Sodded areas, not less than 30 days after substantial completion of the project.

C. Maintain grass by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading and regrassing as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

3.04 CLEANUP AND PROTECTION

A. During landscape work, keep pavements clean and work area in an orderly condition.

B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed.

3.05 INSPECTION AND ACCEPTANCE

A. When landscape work is completed, including maintenance, the Owner will, upon request, make an inspection to determine acceptability.

1. Landscape work may be inspected for acceptance in parts agreeable to the Owner, provided work offered for inspection is complete, including maintenance.

B. Where inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by the Owner and found to be acceptable. Remove rejected materials promptly from project site.

END OF SECTION 02900

SECTION 03100 - CONCRETE FORMWORK

PART 1 - GENERAL

1.01 Applicable provisions of "General Conditions", "Supplementary General Conditions" and "General Requirements", Division One, Govern Work under this section.

1.02 DESCRIPTION

A. Work Included: Labor and materials for the furnishing, fabrication, erection and removal of formwork for all cast-in-place concrete.

B. Related Work Specified Elsewhere:

1. Walks and Curbs - Section 02528.

2. Cast-in-Place Concrete - Section 03300.

1.03 APPLICABLE SPECIFICATIONS

A. The latest issue of the following specifications and recommended practices shall become part of this Specification where applicable, except where superseded by particular requirements of this Specification.

1. "Forms for Architectural Concrete", published by Portland Cement Association.

2. Southern Standard Building Code (latest revision, locally accepted).

3. American Concrete Institute (ACI).

PART 2 - PRODUCTS

2.01 MATERIALS

The intent of this Specification is to produce a quality product, and nothing expressed or implied within the Specification shall alter that quality.

A. Wood Forms:

1. Unexposed Surfaces: No. 2 grade or better lumber.

2. Exposed Surfaces: Plywood or with linings as specified. On walls, plywood forms shall be large sheets symmetrically arranged.

B. Plywood: DFPA Grade B-B Plywood, Class 1, exterior, conforming to P.S. 1-66, minimum 5 ply 5/8" thick.

C. Form Lining:

1. Plywood: HDO Ext-DFPA Group 4, 5/16" thick (with high density overlay).

2. Fiberboard: Treated hard pressed fiberboard having low degree of water absorptivity, 3/16" thick, one side smooth.

D. Metal Forms: As approved, and can produce surfaces equal to wood forms.

E. Form and Release Agents: Shall be of an approved product with a letter from manufacturer addressed to Architect stating that the form and release agents will not, at any time, discolor concrete or other materials in contact with concrete, and that the other materials will not be affected in any way, shape or form, including bonding to concrete. The same form and release agents shall be used throughout the complete construction to avoid difference in concrete.

NOTE: Contractor shall be solely responsible for the verification with other affected contractors; that form and release agents used will be compatible with other construction materials, equipment and finishes.

2.02 DESIGN

A. Design forms to withstand all fluid pressures, live-loads and impact loads.

PART 3 - EXECUTION

3.01 CONSTRUCTION

A. General:

1. Conforming to shapes, lines and dimensions indicated, substantial, mortar

tight and well secured against warping, bulging and deflection.

2. Set and maintain designated lines until concrete has set.

3. Vertical Supports: Of adequate strength to carry all loads.

4. Support shores resting on ground on mud sills of proper size and design to prevent settlement. If suitable mud sill cannot be installed, furnish truss supports for forms.

5. Arrange brackets and ties to permit tightening and bracing while pouring concrete so as to avoid bulging or deflection.

6. Remove all nails and thoroughly clean all lumber intended for reuse in forms, keep in good condition as to accuracy, shape and strength.

B. Metal Forms:

1. Of design and thickness meeting design strength requirements.

2. Must line up accurately and present a uniform smooth surface.

3. Clamps, pins or connecting devices designed to hold forms rigidly together and allow removal without injury to concrete.

4. Keep forms free from rust, grease or other foreign matter that discolors concrete.

C. Form Ties: Approved devices for internal ties for wood or metal forms, arranged that no metal will be within one inch of any finished surface.

D. Alignment: After concrete is placed and before initial set, true forms to line and level by means of adjustable shores, jacks, shims or other approved method. If bulging, sagging or deflection in forms cannot be corrected to the satisfaction of the Architect, concrete must be removed immediately, forms reset and braced against further movement.

E. Slots, Chases, Recesses, Key, Etc.: Constructed as shown on the Drawings and as required by the work of other trades. Build bulk heads with keys in walls and footing for stopping concrete. Box out for all temporary openings, such as joists, shafts, etc.,

build forms to seal up when and as required.

F. Built-In Work: Consult other trades in advance and make provisions for installation and securing of their work into formwork as required.

G. Qualified Workmen: Shall be on duty during placing of concrete to correct faulty formwork and insure that there is no movement of shores, braces or other supports.

H. Subcontractor for concrete formwork shall be responsible for adequate design and construction of all forms where power buggies are used, or two-stage shores are used.

3.02 REMOVAL OF FORMS

A. The removal of forms shall be accomplished as soon as possible, as approved by General Contractor, to allow for the rubbing of concrete as required. Remove all slurry ribbing or other imperfections immediately after removal of forms on exposed areas to insure a first quality surface.

B. In no case shall supporting forms or shoring be removed until members have acquired sufficient strength to safely support their weight and load thereon.

END OF SECTION 03100

SECTION 03210 - CONCRETE REINFORCING

PART 1 - GENERAL

1.01 Applicable provisions of "General Conditions", "Supplementary Genetal Conditions" and "General Requirements", Division One, govern work under this section.

1.02 DESCRIPTION

A. Work Included: Labor and materials complete all concrete reinforcing steel, indicated on Drawings as specified herein, or both, for all site-cast concrete.

B. Related Work Specified Elsewhere:

1. Concrete Walks and Curbs - Section 02528.
2. Concrete Form work - Section 03100.
3. Cast-in-Place Concrete - Section 03300.
4. Reinforced Unit Masonry - Section 04340.

1.03 QUALITY ASSURANCE

A. The "Code of Standard Practice for Reinforcing Materials and Service", as published by the Concrete Reinforcing Steel Institute shall become a part of this Specification.

B. Southern Standard Building Code (latest adopted edition and revisions).

C. American Concrete Institute (ACI).

D. American Society for Testing and Materials (ASTM).

1.04 SUBMITTALS

A. Shop Drawings:

1. Shop drawings shall be prepared immediately on award of this Contract. No steel shall be ordered until shop drawings have been approved.
2. Drawings shall indicate necessary information on fabrication and erection.
3. Manufacturer's Certificate - Certify that products meet or exceed specified requirements.
4. Submit certified copies of mill test report of reinforcing materials analysis.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Metal Reinforcement: Shall conform to current specifications of ASTM.

B. Bars: ASTM Specification A-615, Grade 60, for Billet-Steel Bars for concrete reinforcement.

1. Provide special size bars where called for on Drawings.
2. Provide all security reinforcement as detailed and required on Contract Documents.

C. Accessories: Such as bolsters, spacers, ties, chairs, shall be hot-dipped galvanized furnished to permit proper placement of steel.

D. Welded steel wire fabric: ASTM A185 plain type flat sheets.

2.02 FABRICATION

A. Shop drawings showing dimensions, bar schedules, bending details, stirrup spacing and all other details shall be submitted for approval before beginning of fabrication of reinforcing materials in accord with requirements of General Conditions.

B. All bars shall be shop fabricated and cut to required length.

C. Bars with kinks, twists or bends, other than shown by approved shop drawings, not to be used.

2.03 CLEANING

A. All reinforcing shall be free from rust, scale, grease or other coating which might prevent proper bond.

B. Provide means at site for cleaning before placement.

C. Where there is delay in depositing concrete, reinforcement shall be reinspected and when necessary, cleaned and retied.

2.04 STORAGE

A. At site, in covered racks to keep steel at least 6" above ground - No

Exceptions. Reinforcing found laying on natural grade will be removed from site immediately.

B. Protect, as required against excessive rusting or mechanical injury.

PART 3 - EXECUTION

3.01 PLACING

A. Placing of reinforcing shall be in strict accordance with Concrete Reinforcing Steel Institute, and "Specifications for Placing of Reinforcements"

B. Before placing reinforcing, all forms to be coated with form and release agents to avoid coating reinforcing steel.

C. All reinforcing shall be placed accurately and held in position to prevent its displacement during concrete operations by using at intersections annealed wire of not less than No. 18 gauge. It shall be supported by metal chairs or spacers.

D. All spacing shall be as shown on Drawings.

E. Footing, Wall and Slab Reinforcement:

1. Unless otherwise shown, cover reinforcing with concrete to following thickness:

Footing Bottoms	3"
Walls	2"
Slabs	3/4"
Slabs (mid slab)	2"
Columns	1-1/2"
Beams 1-1/2"	

2. Support reinforcing at proper intervals and distances from forms by means of welded wire spacers or chairs.

3. Separate multiple layers with approved spacers.
4. All rods securely wired with No. 18 gauge annealed wire at all intersections with reinforcement and temperature rods, spacers or chairs.

5. Wire fabric where shown, to extend to within 2" of all edges of slab or sections. Do not extend fabric across expansion joints. Lap adjacent sheets at least 6".

F. Shrinkage and Temperature Reinforcement:

1. Where not otherwise shown on Drawings, provide temperature steel or mesh equivalent to a ratio of .003 reinforcement area to concrete area. (For foundation, slabs, aprons, etc.)

END OF SECTION 03210

SECTION 03250 - CONCRETE ACCESSORIES

PART 1 - GENERAL

1.01 MATERIALS

A. Tie Wire: 18 gauge annealed.

B. Concrete Chairs: 4,000 psi.

1. Unreinforced; precast (3 inch x 3 inch).

2. Embedded 18 gauge tie wire.

C. Beam, Slab, and Bar Chairs:

1. Steel: Standard bright basic wire, minimum tensile strength; 78 ksi.

2. Legs turned plastic coated or dipped.

3. Items conforming to ACI-315.

4. Continuous High Chairs: legs 8 inches center to center, continuous high chairs.

5. Beam Bolsters: #8 bars or larger; heavy beam bolsters.

D. Screed Chairs: Steel, reusable holders and adjustable.

PART 2 - PRODUCTS

2.01 GENERAL

A. Wire-tie reinforcing in accordance with CRSI specifications.

B. Tie slab bolsters and continuous high chairs to reinforcing in at least two (2) places.

C. Support reinforcing; do not "hang" by tie wire.

D. Hold reinforcing rigid.

E. Accessory spacing according to ACI-315.

F. Use column corner chairs; each corner near top.

1. Minimum three (3) for round columns.

END OF SECTION 03250

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 Applicable provisions of "General Conditions", "Supplementary General Conditions" and "General Requirements", Division One, Govern work under this section.

1.02 DESCRIPTION

A. Work Included: Labor and materials to complete cast-in-place concrete work indicated on Drawings and specified herein.

B. Related Work Specified Elsewhere:

1. Form Work - Section 03100.

2. Reinforcing Steel - Section 03210.

1.03 GENERAL NOTES

A. Reinforcing steel will be furnished and placed under Section 03210, but this Subcontractor shall cooperate fully in placing and no concrete shall be poured until approved by the Architect.

NOTE: Contractor shall be solely responsible for the verification with other affected contractors that materials, equipment and finishes incorporated into this project are compatible with each other. Notify Architect, in writing, of incompatibility before installation.

1.04 APPLICABLE SPECIFICATIONS

A. The latest issue of the following specifications, test methods and recommended practices shall govern except where superseded by particular requirements of this Specification.

B. American Society for Testing Materials:

1. Specifications for Ready-Mix Concrete: ASTM C94-74a.

2. Specifications for Portland Cement: ASTM C150-77.

3. Specifications for Air Entraining Portland Cement: ASTM C150-77.

4. Specifications for Blended Hydraulic Cements: ASTM C595-76.

5. Specifications for Concrete Aggregates: ASTM C33-77.

6. Specifications for Air Entraining Admixtures for Concrete: ASTM C260-74.

7. Method of Test for Slump of Portland Concrete: ASTM C143-74.

8. Method of Sampling Fresh Concrete: ASTM C172-71.

9. Method of Testing for Air Content of Freshly Mixed Concrete by the Pressure Method: ASTM C231-75.

10. Method of test for weight per cubic foot, yield and air content (gravimetric) of concrete: ASTM C138-75.

11. Method of making and curing concrete compression and flexure test specimens in the field: ASTM C31-75.

12. Method of test for compressive strength of molded concrete cylinders: ASTM C39-72.

C. American Concrete Institute:

1. Recommended Practice for Selecting Proportions for Concrete: ACI 613.

2. Recommended Practice for Cold Weather Concreting: ACI 604.

3. Recommended Practice for Hot Weather Concreting: ACI 605.

1.05 STANDARDS

A. The intent of this Specification is to produce a quality product and nothing expressed or implied within Specification shall alter that quality.

B. If such product cannot be produced as specified, notify Architect, in writing, a minimum of ten (10) days prior to bid date so an Addendum can be issued to clarify any questions. If such notice is not received by Architect, it will be the responsibility of the General Contractor to rectify the construction within the intent and approval

of the Architect, at no cost to Owner.

1.06 SUBMITTALS

A. Product Data: provide data on joint devices, attachment accessories, and admixtures.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aggregates: The aggregates shall be well-graded and maintained within ASTM limits to insure uniformity throughout the concrete, and shall be furnished from the same quarry to control consistency in color.

1. In general, comply with ASTM C33-77.

2. Fine: Natural sand, clean, hard, strong, durable uncoated grains, free from all injurious, deleterious substances, passing No. 4 sieve.

3. Coarse gravel or crushed stone, clean, hard, strong, durable, uncoated pieces free from deleterious substance. 1-1/2" maximum size aggregate shall conform to gradation for size No. 4, and 3/4" aggregate to size No. 57, in Table II of ASTM C33. When 1-1/2" size is used, it shall be proportioned with the 3/4" aggregate so as to produce gradation conforming to size No. 67 in Table II of ASTM C33. 1-1/2" maximum size shall be used for general concrete work and 3/4" maximum for topping

4. Prior to starting construction, the General Contractor shall furnish a statement to the Architect giving the source, sieve analysis and a specified gravity of both fine and coarse aggregate; and proportioned by weight (3:4:6) of cement and fine and coarse aggregates that will be used in the manufacture of each class of concrete specified. No change in source of materials shall be made without prior notification to the Architect.

5. Structural Concrete: Waylite ASTM C330-77.

B. Portland Cement: All materials shall be furnished as specified, once approved, the materials shall be furnished by one source and manufacturer for the entire project. The cement manufacturer and mill shall not be changed.

1. Standard Portland Cement: ASTM C150-77, Type I.

2. High Early Strength Portland Cement: ASTM C150-77, Type III.

3. Air Entrained Portland Cement: ASTM C150-77, Type IA, with Ozoium volume in accordance with ASTM C138-75. Only one brand of approved cement shall be used for exposed Architectural concrete throughout any one structure of composite element. See Section 2.12, Sample Wall.

4. Flyash ASTM C618 Type F - Do not use for exposed architectural concrete. Limit use of Flyash to not exceed 18% of cement content by weight.

C. Curing Materials: Concrete floors shall be cured with a product compatible with the floor finish that is to go over or be applied to the concrete slab, as per manufacturer's recommendations. It shall be of an approved product with a letter from manufacturer addressed to Architect, stating that curing materials will not, at any time, discolor concrete or other materials in contact with concrete, and that the other materials will not be affected in any way, shape or form, including bonding to concrete. The same material shall be used throughout the complete construction to avoid difference in concrete.

NOTE: Contractor shall be solely responsible for the verification with other affected contractors that materials used will be compatible with other construction materials, equipment and finishes.

1. Kraft Paper: Commercial quality, double sheet Kraft paper cemented together with asphalt, waterproofed, reinforced with cord of fiber running in both directions, orange label Sisalkraft or nonstaining Seekure.

2. Curing and Sealing Compound: Shall be Master Builders, (clear) "Master-Seal" installed as required by manufacturer.

3. Curing Compound: Special water soluble curing agent, with no waxes, resins or oils, that forms a barrier against moisture loss, without staining concrete surfaces. Must leave finish surface that will permit adhesion of other flooring materials, ceramic and resilient tiles, without loss of bonding. Meets ASTM C309-74, ASTM C156-74 and CRD C300-58T.

D. Expansion Joints:

1. Premolded expansion joint strips 1/2" thick of premolded resilient, compressible, re-expanding, nonextruding, bituminous and fiber materials, conforming to ASTM D1752-67, Type I, as manufactured by Sonneborn Products, Inc.

2. Plastic joint fillers, where called for on Drawings, or specified, shall be foamed Poly-Vinyl Chloride Plastic premolded joint filler, thickness and width as shown. As manufactured by Sonneborn Products, Inc.

E. Contraction Joints: Contraction joints to be similar to Heckman, No. 95, or Vulco.

F. Felt: 15 lbs. asphalt saturated, ASTM D250-70.

G. Water: Water shall be potable, clean, free of oil, acid and injurious amounts of vegetable matter, alkalis and other salts. All water used shall be furnished from one source.

2.02 SCREEDS:

A. Sufficient wood or metal screeds, accurately leveled and securely fastened shall be provided to bring the floor and other slabs to the required elevation with the strike board.

2.03 CONCRETE MIX

A. Ready-Mixed Concrete (subject to the following):

1. Concrete must meet all requirements of the ASTM C94-74a and those herein specified for materials, proportioning, mixing and other details of manufacture, quality and delivery.

2. Submit suitable evidence as to experience, equipment and capacity of plant to Architect for approval.

B. Pump Mix Concrete Approval: Contractor may submit, for Architect's approval, a complete concrete mix design for pumping concrete, with justification for request, including equipment to be used, location and method of pour. Concrete mix must comply with all structural requirements as set forth in these specifications.

C. Mix: Each class of concrete shall be furnished in accordance with the following schedule:

Class of Concrete		Min. Cement Comprehensive Strength at 28 Days, PSI	Max. Size of Aggregate in Normal Concrete	Content Bags Per Cu. Yd. 5 Inch Slump
Poured Concrete Walls, Foundations and Buttresses	-	3000	1-1/2"	5-1/4
Concrete Block Grout (Chatt) Fill	-	4000	3/8"	6
Columns and Beams	-	4000	3/4"	6-1/4
Sand/Cement Grout	-	3000	Number 4 Sieve	8

D. Unless otherwise specified herein, concrete throughout this project shall be normal 3000 lb., 3/4" aggregate.

E. Cement content specified above is minimum.

1. If test results indicate strength greater than specified, Architect may approve reduction in cement content with appropriate credit to Owner.

2. Should test results indicate strength below that specified, additional cement shall be added without cost to Owner.

F. Discharge of concrete shall be completed within 1-1/2 hours, or before drum has revolved 300 revolutions, whichever comes first, after the introduction of mixing water to cement and aggregates, or the introduction of the cement to the aggregates.

In hot weather, or under conditions contributing to quick stiffening of the concrete, a time limit will be required to be less than 1-1/2 hours.

The maximum temperature of concrete shall, at no time during its production, transportation or pouring, exceed 90 degrees F.

2.04 VERIFICATION OF MIX DESIGN

A. Except where waived by the Architect, each class of concrete specified for the project

shall be represented by five tests (10 specimens). Each batch shall be at least five cu. yds. in size, shall be made with cement and aggregate proposed for use, and shall not contain any accelerators.

B. Tests: See Section 01410.

2.05 TOLERANCES IN SLUMP

A. When specified slump is three inches or less, the tolerance shall be plus or minus one-half inch (1/2").

B. When specified slump is greater than three inches, tolerance shall be plus or minus one inch (1").

2.06 ADMIXTURES

A. Admixture shall not be used without approval of Architect.

B. When air-entrained concrete is specified and an admixture is used to secure the desired air content, the admixture shall conform to ASTM Specification C260.

C. At Contractor's option, with Architect's written approval, an ASTM C494, Type A, normal setting water reducing agent, or a Type D, set retarding water reducing agent may be added to the concrete when ambient temperature is above 70 degrees F. Type G is also acceptable.

1. Both Type A and Type D admixtures shall be used at uniform dosages to provide uniform strengths as analyzed by ACI 214. The Type D admixture shall produce a set retardation of 20% without retarding the early and final strength again. Both types shall produce strength increases of at least 20% at early ages and 15% at 28 days when added to the specified mixes. Both types A and D admixtures shall show a reduction in bleeding over plain concrete when measured in accordance with ASTM C232. Neither type A or Type D admixture shall increase the air content of the concrete, nor contain chloride or nitrate ions.

D. No other admixtures will be permitted. Absolutely no calcium chloride in any form shall be used.

2.07 MEASURING MATERIALS

A. The cement, aggregates and water shall be measured and combined strictly in accordance with ASTM Specification C94.

2.08 MIXING AND DELIVERY

A. Ready-mixed concrete shall be mixed and delivered to the point designated by the means and standards set forth by ASTM Specification C94.

B. Mixers and agitators may be examined by a representative of the Owner for

changes in conditions due to the accumulation of hardened concrete or mortar through wear of the blades.

C. When concrete is mixed in a truck mixer loaded to its maximum rated capacity, the number of revolutions of the drums or blades at a mixing speed shall not be less than 70 nor more than 100.

D. When a truck mixer or a truck agitator is used for transporting concrete, the concrete shall be delivered to the site of the work and discharge shall be completed within one and one-half hours, or before the drum has revolved a total of 300 revolutions, whichever comes first, after the introduction of mixing water to the cement and aggregates, or mixing of cement and aggregates, or mixing of cement and aggregates, unless a longer time is specifically authorized by Architect.

E. In hot weather, or under conditions contributing to quick stiffening of concrete, a time less than 1 and 1/2 hours may be specified by the Architect.

F. No water shall be added on the job unless authorized by the Architect. The amount of water, if added, shall be recorded on all copies of the delivery ticket hereinafter required. If water is permitted to be added to mixed concrete upon arrival at the job, an additional mixing of 20 revolutions of the drum shall be required.

G. Concrete delivered in outdoor temperatures lower than 40 degrees F. shall arrive at the site of the work having a temperature of not less than 60 degrees F., unless otherwise specified or permitted by the Architect/Engineer.

2.09 DELIVERY TICKETS

A. With each load of concrete delivered to the job, there shall be furnished, by the ready-mixed concrete producer, duplicate delivery tickets, one for the Contractor and one

for the Architect. Delivery tickets shall provide the following information:

1. Date;

2. Name of ready-mixed concrete plant;

3. Job location;

4. Contractor;

5. Type (standard, A.E., or H.E.S.) and brand name of cement;

6. Class and specified cement content in bags per cu. yd. of concrete;

7. Truck number;

8. Time dispatched;

9. Amount of concrete in load in cu. yds.;

10. Admixtures in concrete, if any;

11. Maximum size of aggregates; and

12. Water added at job, if any.

2.10 INSPECTION AND TESTING

A. All required sampling, preparing of specimens and testing shall be performed by an independent laboratory selected and employed by the Contractor, approved by the Architect.

1. Contractor shall cooperate in the taking of test samples, and shall make adjustments in test samples, and shall make adjustments in mix, based on results of tests, and directed by Architect.

B. Samples of concrete shall be obtained in accordance with ASTM Method C172, and shall be made an cylinders stored without being disturbed for the first 24 hours.

C. Slump Tests shall be made daily and more often, at the option of the Architect,

following the procedure in ASTM Method C143. Slump tests shall always be made from the same batch from which strength tests are made. When air entrained concrete is used, air content tests shall be made daily or more often in accordance with ASTM Method C231. If the slump measure of air content falls outside the limits specified, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, the concrete shall be considered to have failed to meet the requirements of the Specifications and shall not be used in the structure.

D. Cylinders for strength test shall be made in accordance with ASTM Method C31. During the first 24 hours, all test specimens shall be covered and kept at air temperature between 60 degrees and 80 degrees F. At the end of 24 hours, specimens shall be carefully transported to the testing laboratory where molds shall be removed and cylinders shall be cured in a moist condition at 65 to 75 degrees F. until time of test. Strength tests shall be made frequently at the

direction of the Architect, except that in no case shall a given class of concrete be represented by less than five tests for the entire job.

E. A strength test for any class of concrete shall consist of six standard cylinders from a composite sample secured from a single load of concrete in accordance with ASTM Method C172, with two cylinders tested at 7 days, two at 28 days and two at 56 days. The test results at 28 days shall be the average of the strength of the specimens determined in accordance with ASTM Method C39, except if one specimen in a test shows manifest evidence of improper sampling, molding or testing, it shall be disregarded.

F. Strength tests shall be made for each of the following conditions: Each day's pour; each class of concrete; each change of supplies or source; and for each 25 cu. yd. of concrete or fraction thereof.

PART 3 - EXECUTION

3.01 PLACING

A. Notification:

1. Upon completion of forms and placing of reinforcing steel and before concrete is poured, notify all contractors allowing them reasonable time to

complete their work.

2. Notify Architect at least 24 hours in advance before pouring any unit of structure.

B. Preparation: Before placing concrete:

1. Clean all mixing and transport equipment

2. Remove all dirt, chips and other debris from forms or place to receive concrete.

3. Flush and wet down forms thoroughly to close any cracks between boards.

4. Wet down subgrade with as much water as it will absorb readily.

5. Do not place concrete in dry forms or on dry subgrade.

C. Handling: handle all concrete in manner to prevent separation or loss of ingredients.

3.02 CONSTRUCTION JOINTS

A. Use and location as approved by Architect.

B. Plumb bulkheads with keys shall be used at all joints.

C. In no case shall pours be stopped at points that would impair strength of structure.

D. Clean and roughen the concrete surfaces and slush with neat cement grout immediately before placing additional concrete.

3.03 EXPANSION JOINTS AND CONTROL JOINTS (See ACI-318)

A. Where joint compound is indicated, install pre-molded expansion joint filler strips topped with tapered, dressed, oiled wood strip, to form groove at least 1" deep. After concrete has set, remove strip and fill groove with compound for poured application.

B. Control Joints: (Cut within 18 hours after pour.) Shall be provided in all slabs on

earth, by means of deep saw cuts, a minimum of 1/4 of slab depth at 20'-0" continuously o.c. each way, as directed by Architect.

3.04 CONCRETING COLD WEATHER (See ACI-604)

A. Protection:

1. When temperature is at or below 40 degrees F. when placing or within next 24 hours.

2. Provide heated concrete material with temperature of concrete when placed between 50 and 90 degrees F.

3. No salt or other chemical admixture permitted.

4. Provide adequate housing covering and heating for freshly placed concrete for a minimum period of 72 hours after placing.

B. Contractor's Responsibility:

1. Make good, in manner acceptable to Architect, all damages to concrete work due to water, freezing, excessive heating and too rapid drying out.

3.05 HOT WEATHER CONCRETING (See ACI-605)

A. Temperature of concrete shall not exceed 90 degrees F. Control by:

1. Cooling aggregates.

2. Use of cement with maximum temperature of 170 degrees F.

3. Use cold water.

4. Finish promptly.

5. Protect and cure properly.

3.06 CURING

A. All concrete shall be moisture cured for a period of seven (7) days after placing.

B. Vertical construction such as walls, columns, beam sides, etc., shall, if forms are removed in less than seven (7) days, be given a spray coat of liquid curing compound at a rate sufficient to provide equivalent coverage. Compound shall have no fugitive dye or pigment.

C. Horizontal surfaces shall be cured as specified under "slabs".

D. NOTE: Do not apply curing compound at construction joints.

E. Cure concrete with a residual-free compound where ceramic, pavers, quarry and terrazzo and other finishes are being applied.

3.07 SLABS

A. General:

1. To be level, except where floor drains occur, the floor to be pitched uniformly to drains. (See 3.08, this section.)

B. Slabs:

1. Make sure all underslab work is completed.

2. Pour slabs to required levels and thickness shown in one monolithic operation, with joints as designated and as before specified. Subgrade shall vary in elevation as required to maintain slab thickness.

C. Curing: As soon as concrete is set where it can be walked on without tracking (1-8 hours), apply coats(s) of specified sealer and/or curing agent under supervision of manufacturer's representative.

D. Protection of Finished Work:

1. While installing concrete work adjacent to work of other trades, protect such other work against damage or soiling.

3.08 FINISHING

A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.

B. Provide formed concrete surfaces with smooth rubbed finish.

C. Wood float surfaces which will receive ceramic tile with full bed setting system.

D. Steel trowel surfaces which will receive carpeting, resilient flooring, thin set ceramic tile and thin set quarry tile.

E. Steel trowel surfaces which are scheduled to be exposed. Seal all exposed concrete floor surfaces.

F. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains at 1/4 inch per foot as indicated on drawings.

3.09 TOLERANCES

A. Maximum variation of surface flatness for exposed concrete floors, resilient flooring and carpeting: 1/4 inch in 10 ft.

3.10 GUARANTEE

A. Subcontractor shall, and hereby does, guarantee that all work executed under this Section will be free from defects of materials and workmanship for a period of one (1) year from date of "Substantial Completion".

END OF SECTION 03300

SECTION 03370 - CONCRETE CURING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Initial and final curing of horizontal and vertical concrete surfaces.

1.02 RELATED SECTIONS

A. Section 03300 - Cast-in-Place Concrete.

1.03 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.

B. ACI 302 - Recommended Practice for Concrete Floor and Slab Construction.

C. ACI 308 - Standard Practice for Curing Concrete.

D. ASTM C171 - Sheet Materials for Curing Concrete.

E. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

F. ASTM D2103 - Polyethylene Film and Sheeting.

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: provide data on curing compounds, compatibilities, and limitations.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and ACI 302.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products under provisions of Section 01600.

B. Deliver curing materials in manufacturer's packaging, including application instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Membrane Curing Compound Type A: ASTM C309 Type 1 or 1-D except that moisture loss shall not exceed 0.03 gr./sq. cm.

B. Water: Potable, not detrimental to concrete.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to be cured.

3.02 EXECUTION - HORIZONTAL SURFACES

A. Cure floor surfaces in accordance with ACI 308.

B. Membrane Curing Compound: Apply curing compound in accordance with manufacturer's instructions in one (1) coat.

3.03 EXECUTION - VERTICAL SURFACES

A. Cure surfaces in accordance with ACI 308.

B. Membrane Curing Compound: Apply compound in accordance with manufacturer's instructions.

3.04 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.

B. Do not permit traffic over unprotected floor surface.

END OF SECTION 03370

SECTION 04090 - MASONRY ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes: Mortar dropping collection device for masonry cavity walls.

B. Related Sections: Section(s) related to this section include:

1. Clay Masonry Units.

1.02 SYSTEM DESCRIPTION

A. System Description

1. Use The Mortar Net as part of standard masonry cavity wall flashing/weep hole wall drainage systems. The Mortar Net keeps weep hole vents open and flashing free of mortar droppings and debris by catching and permanently suspending droppings above the level of the top of the weep hole vents, by preventing mortar from forming a continuous barrier against proper water flow to the weeps and by providing routes through the body of the product itself for water to flow to the flashing and weeps.

1.03 SUBMITTALS

A. General - Submit listed submittals in accordance with Conditions of the contract and Division 1 Submittal Procedures Section.

B. Product Data - Submit product data, including manufacturer's SPEC-DATA product sheet, for specified products.

C. Samples - Submit selection and verification samples.

D. Quality Assurance Submittals - Submit the following:

1. Certificates - Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria.
2. Manufacturer's instructions - Manufacturer's installation instruction.

E. Closeout Submittals - Submit the following:

1. Warranty: Warranty documents specified herein.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

B. Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

1.05 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

1. Do not expose material to direct sunlight for more than 2 weeks. If material is protected from exposure to direct sunlight it may be stored indefinitely.

1.06 SEQUENCING

A. General: Install The Mortar Net product after flashing has been installed, the first 1 or 2 courses of brick have been laid, and weep holes have been created. Install product before third or higher courses of brick have been laid.

1.07 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract 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 Contract Documents.

1. Warranty Period: Lifetime warranty.

PART 2 - PRODUCTS

2.01 SINGLE-WYTHE CMU WALL DRAINAGE SYSTEM

A. Cavity Drainage Protection: Provide recycled polyester mesh shaped to maintain cavity airflow and drainage while suspending mortar droppings at unequal heights. Provide one or more thickness as required to fill cavity width. Install per manufacturer's instructions. Provide independent test report on request.

1. Mortar Net by Mortar Net USA 800-664-6638

2. Mortar Net by Sandell Manufacturing 800-283-3888

3. Mortar Net by Holmann & Barnard 800-645-0616

B. Single Wythe Masonry Drainage Protection: Provide specialty mesh shaped to maintain CMU cell/core airflow and drainage by access through mortar droppings. Provide mesh thickness per manufacturer's instructions based on CMU size. Independent structural engineer's analysis available upon request.

1. Mortar Net by Mortar Net USA 800-664-6638

2. Mortar Net by Sandell Manufacturing 800-283-3888

3. Mortar Net by Holmann & Barnard 800-645-0616

C. Weep Hole Vent: Provide UV resistant recycled polyester mesh inserted in open head joint. Match color selection with mortar color.

1. Mortar Net by Mortar Net USA 800-664-6638

2. Mortar Net by Sandell Manufacturing 800-283-3888

3. Mortar Net by Holmann & Barnard 800-645-0616

2.02 SUBSTITUTIONS

A. Product Substitutions: No substitutions permitted.

2.03 MATERIALS

A. Materials: Manufacturer's standard Mortar Net material for specified product.

1. All dimensions are nominal. Measurements are inclusive of the continuous bottom strip and the dovetail shape.
2. Four available sizes: 1" (25.4 mm) and 0.4" (10.2 mm) thicknesses by 10" (254 mm) height by 5' (1524 mm) long. 2" (51 mm) thick by 10" (254 mm) x 5' (1524 mm) long.
3. Continuous bottom strip on all sizes of material is 3" (76.2 mm) high, regardless of material thickness or overall material height.
4. 1" (25.4 mm) thick product is high density polyethylene (HDPE), 0.4" (10.2 mm) thick product is nylon, and 2" (51 mm) thick material is recycled polyester. Product is a 90% open weave mesh in a dovetail configuration connected by a continuous bottom strip.

2.04 SOURCE QUALITY

A. Source Quality: Obtain the Mortar Net materials from a single manufacturer.

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections are acceptable for product installation in accordance with manufacturer's instructions.

1. Match product size to cavity size. Cavity should be no more than 1/4" (6.4 mm) wider than 1"(25.4 mm) thick material and 2" (51 mm) thick material, and 0.4" (10.2 mm) thick material should touch both the outer wythe and the inner wall. For cavities larger than 2" (51 mm),place rigid insulation of sufficient height to extend at least 6" (152 mm) above the top of the Mortar

Net against the outside of the inner wythe and of appropriate thickness to reduce the cavity to the appropriate size.

2. Inspect for and repair holes in flashing immediately prior to installing Mortar Net.

3.03 PREPARATION

A. Preparation: Clean flashing and weep holes so they are free of mortar droppings and debris immediately prior to installing Mortar Net. If wicks are used (not recommended), prevent mortar from coating or covering wicks inside the cavity. Washing flashing with water or chemicals prior to installation is not necessary.

3.04 INSTALLATION

A. Mortar Net Installation:

1. For most walls, install 1 continuous row of The Mortar Net at base of wall and over all wall openings directly on flashing.
2. To prevent mortar bridging between the outer wythe and inner wall, install flashing extending from the bottom of The Mortar Net to at least 6" (152 mm) above the top of The Mortar Net.
3. Multiple thicknesses of The Mortar Net may be installed to match cavity widths and if excessive droppings are expected. Inspection, preparation and installation procedure for multiple thick-nesses is the same as for single thickness. When installing multiple thicknesses, align the dove-tail sections with each other.
4. To match cavity width to product thickness without using multiple thicknesses of The Mortar Net, place rigid insulation of appropriate thickness against outside face of inner wall.
5. Lay the first 1 or 2 courses of brick at flashing level, then install The Mortar Net continuously by placing it against the inside of the openings. No fasteners or adhesives are required, and mortar need not have set.
6. The Mortar Net shall not come in contact with wall ties standard wall tile installations, but if it does, it may be cut or torn to accommodate wall ties, conduit, plumbing or other materials that bridge or intrude into cavity between inner and outer walls.
7. Compress The Mortar Net horizontally so it can be forced into cavities slightly smaller than its nominal thickness without affecting Mortar Net or wall performance.

    a. When forcing The Mortar Net into a cavity, be sure mortar has set sufficiently to resist outward pressure from product.

B. Related Products Installation: Refer to other sections for installation of related products as follows:

1. Masonry: Refer to Division 4 Clay Masonry Units section.

3.05 PROTECTION

1. Protection: Protect installed product from damage during construction.

END OF SECTION 04090

SECTION 04100 - MORTAR AND MASONRY GROUT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Mortar and grout for masonry.

1.02 RELATED SECTIONS

A. Section 01410 - Testing Laboratory Services: Testing laboratory services.

B. Section 04340 - Reinforced Unit Masonry System: Installation of mortar and grout.

1.03 REFERENCES

A. ACI 530 - Building Code Requirements for Masonry Structures.

B. ACI 530.1 - Specifications for Masonry Structures.

C. ASTM C5 - Quicklime for Structural Purposes.

D. ASTM C91 - Masonry Cement.

E. ASTM C94 - Ready-Mixed Concrete.

F. ASTM C144 - Aggregate for Masonry Mortar.

G. ASTM C150 - Portland Cement.

H. ASTM C199 - Test Method for Pier Test for Refractory Mortar.

I. ASTM C207 - Hydrated Lime for Masonry Purposes.

J. ASTM C270 - Mortar for Unit Masonry.

K. ASTM C387 - Packaged, Dry, Combined Materials, for Mortar and Concrete.

L. ASTM C404 - Aggregates for Masonry Grout.

M. ASTM C476 - Grout for Masonry.

N. ASTM C595 - Blended Hydraulic Cement.

O. ASTM C780 - Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

P. ASTM C1019 - Method of Sampling and Testing Grout.

Q. ASTM C1072 - Method of Measurement of Masonry Flexural Bond Strength.

R. ASTM C1142 - Ready-Mixed Mortar for Unit Masonry.

S. ASTM E447 - Test Methods for Compressive Strength of Masonry Prisms.

T. ASTM E518 - Test Method for Flexural Bond Strength of Masonry.

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Include design mix, indicate whether the Proportion of Property specification of ASTM C270 is to be used, required environmental conditions, and admixture limitations.

C. Reports: Submit reports on mortar indicating conformance of mortar to property requirements of ASTM C270 component mortar materials to requirements of ASTM C270 and test and evaluation reports to ASTM C780.

D. Reports: Submit reports on grout indicating conformance of component grout materials to requirements of ASTM C476 and test and evaluation reports to ASTM C1019.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 530 and ACI 530.1.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 01600.

B. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Portland Cement: ASTM C150, Type 1.

B. Mortar Aggregate: ASTM C144, standard masonry type.

C. Hydrated Lime: ASTM C207, Type S SA N NA.

D. Grout Course Aggregate: ASTM C404.

E. Water: Clean and potable.

F. Bonding Agent: Epoxy type.

2.02 MORTAR MIXES

A. Use Type M or S mortar for all exterior masonry work.

B. Use Type N mortar for all interior masonry work.

2.03 MORTAR MIXING

A. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Add mortar color and admixtures in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.

D. Do not use anti-freeze compounds to lower the freezing point of mortar.

E. If water is lost by evaporation, re-temper only within two (2) hours of mixing.

F. Use mortar within two (2) hours after mixing at temperatures of 90 degrees F., or two-and-one-half (2-1/2) hours at temperatures under 50 degrees F.

2.04 GROUT MIXES

A. Bond Beams Lintels: 4,000 psi strength at 28 days; 8-10 inches slump; mixed in accordance with ASTM C476 Fine grout.

B. Engineered Masonry: 2,000 psi strength at 28 days; 8-10 inches slump; mixed in accordance with ASTM C476 Fine grout.

2.05 GROUT MIXING

A. Mix grout in accordance with ASTM C94.

2.06 MIX TESTS

A. Test mortar and grout in accordance with Section 01410.

B. Testing of Mortar Mix: In accordance with ASTM C270.

C. Testing of Grout Mix: In accordance with ASTM C1019 for compressive strength and slump.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Request inspection of spaces to be grouted.

3.02 INSTALLATION

A. Install mortar in accordance with ASTM C270.

B. Work grout into masonry cores and cavities to eliminate voids.

C. Do not install grout in lifts greater than 16 inches CMU courses without consolidating grout by rodding.

D. Do not displace reinforcement while placing grout.

E. Remove excess mortar from grout spaces.

3.03 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01410.

B. Test and evaluate mortar in accordance with ASTM C780.

C. Test and evaluate grout in accordance with ASTM C1019.

D. Test mortar and masonry units to ASTM C1072 E447 and E518; test in conjunction with masonry unit sections specified.

END OF SECTION 04100

SECTION 04210 - CLAY MASONRY UNITS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Face brick.

1.02 RELATED SECTIONS

A. A. Section 04065 - Mortar and masonry Grout.

B. Section 04080 - Masonry Reinforcement Systems

1.03 REFERENCES

A. ASTM C 216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's catalog data, detail sheets, and specifications.

C. Selection Samples: For each product requiring color/texture selection, provide full size samples for final selection.

D. Verification Samples: For each product, color, and texture selected, provide two full-size units representing actual color and texture of products to be installed.

1.05 SAMPLE PANELS

A. Construct sample panel at location indicated or directed, and as follows:

1. Size: 4 feet by 4 feet (1.2 m by 1.2 m).
2. Include all unit types and sizes to be used, and mortar joint treatment.

B. Obtain architect's acceptance of sample panel before beginning construction activities of this section.

C. Do not remove sample panel until construction activities of this section have been accepted by architect.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products of this section on pallets, with individual faces protected; keep dry.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer:

Endicott Clay Products Company
Glen-Gery Brick
Boral Bricks
Triangle Brick.

B. Provide all clay masonry units from a single manufacturer.

2.02 CLAY MASONRY UNITS

A. Face Brick: ASTM C 216.

1. Size: Modular, 2-1/4 inches (57.2 mm) high, 7-5/8 inches (193.7 mm) long, 3-5/8 inches (92.1 mm) deep.
2. Texture: To be selected from sample.
3. Color: To be selected from sample.

2.03 ANCHORING MASONRY WORK

A. Provide anchoring devices of the type shown or specified. If not shown or specified, provide standard type for facing an back-up involved.

B. Anchor single wythe masonry veneer to backing with metal ties as follows:

1. Anchor veneer to structural members with metal anchors embedded in masonry joints an attached to structure. Provide anchors with flexible tie section, unless otherwise indicated.

2. Anchor veneer to concrete back-up with dovetail anchors.

3. Space veneer anchors as shown, or if not shown, space not more than 16"o.c. vertically and horizontally. Provide additional anchors at 8" o.c. near openings and edges.

C. Anchor multi-wythe masonry construction 16" o.c. vertically. Reinforcement shall engage all wythes with the longitudinal wires fully embedded in mortar.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Inspect related conditions; do not start work in an area until adverse conditions in that area are corrected.

3.02 PREPARATION

A. Test surfaces for straightness, levelness. Notify architect where grinding or troweled filler corrections are needed.

3.03 INSTALLATION

A. Cut units where required for fitting or for installation of built-in items, using power tools; do not install units having chipped or cracked edges on sight-exposed surfaces.

B. Align base courses to follow accurate floor lines.

C. Align faces plumb, level, and true, with uniform joint widths.

D. Size and portion units for best appearance, with joints arranged neat and symmetrical, free of imperfections detracting from overall appearance.

E. Install masonry accessories specified in sections referenced in RELATED SECTIONS Article of PART 1 of this section, and as indicated on drawings, as installation progresses.

1. Use additional horizontal reinforcing every 16 inches above and below openings at chases and at other points where wall is weakened.
2. Use vertical control joints in accordance with best practices.
3. Use weep joints or vents in vertical joints where indicated, immediately above grade and immediately above flashing, bond beams, solid fill, or other water-stop locations.

F. Using mortars specified in Section 04065, set units in accordance with requirements of sections referenced in RELATED SECTIONS Article of PART 1 of this section, manufacturer's instructions, and as follows:

1. Set units in continuous bed of setting mortar, with continuous mortar joint at head joints.
2. Install units level and plumb to within specified site tolerances; maintain uniform horizontal and vertical joint widths.
3 Set scored-face units in stacked bond where aligned vertical joint appearance is required.
4. Strike and tool setting mortar to concave profile using 5/8-inch (16 mm) diameter non-metallic tooling rod.

5. Rake out setting mortar minimum 1/4-inch (6 mm); allow to set.
6. Tuck-point joints and tool to concave profile using 5/8-inch (16 mm) diameter non-metallic tooling rod; do not use smeared-grout method to fill joints.
7. Tuck-point raked joints and scored joints in block at the same time. Point all joints, leaving no scored joints open.
8. Remove excess mortar from surfaces at once, using clean, soft, damp rags. Do not allow mortar to harden on sight-exposed surfaces.

3.04 FIELD QUALITY CONTROL

A. Architect will observe appearance of installed units; installed masonry surfaces shall be free of imperfections which detract from overall appearance when viewed from a distance of 5 feet (1.5 m) at 90 degrees normal to surface.

3.05 CLEANING

A. Clean installed masonry surfaces in accordance with manufacturer's instructions; do not clean units with products not specified in manufacturer's instructions.

END OF SECTION 04210

SECTION 04340 - REINFORCED UNIT MASONRY SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Concrete masonry units.

B. Reinforcement, anchorage, and accessories.

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 13122 - Pre-engineered Metal Building: Placement of steel anchors for steel beams.

1.03 RELATED SECTIONS

A. Section 01410 - Testing Laboratory Services: Testing laboratory services.

B. Section 04100 - Mortar and Masonry Grout: Mortar and grout.

C. Section 07900 - Joint Sealers: Rod and sealant at control and expansion joints.

1.04 REFERENCES

A. ACI 530 - Building Code Requirements for Masonry Structures.

B. ACI 530.1 - Specifications for Masonry Structures.

C. ASTM A82 - Cold-Drawn Steel Wire for Concrete Reinforcement.

D. ASTM A123 - Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.

E. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate.

F. ASTM A525 - Steel Sheet, Zinc Coated, (Galvanized) by the Hot-Dip Process.

G. ASTM A580 - Stainless and Heat-Resisting Steel Wire.

H. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

I. ASTM B370 - Copper Sheet and Strip for Building Construction.

J. ASTM C55 - Concrete Building Brick.

K. ASTM C90 - Load-Bearing Concrete Masonry Units.

1.05 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate bar sizes, spacings, locations, reinforcement quantities, bending and cutting schedules, supporting and spacing devices for reinforcement, and accessories.

C. Product Data: Provide data for masonry units and fabricated wire reinforcement.

D. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 530 and ACI 530.1.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three (3) years experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01600.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 50 degrees F. prior to, during, and forty-eight (48) hours after completion of masonry work.

B. Maintain materials and surrounding air temperature to a maximum 90 degrees F. prior to, during, and forty-eight (48) hours after completion of masonry work.

1.10 COORDINATION

A. Coordinate work under provisions of Section 01019.

B. Coordinate the masonry work with installation of window anchors.

PART 2 - PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Hollow Load Bearing Block Units (CMU): ASTM C90, Type II - Non-moisture Controlled; normal weight.

2.02 REINFORCEMENT AND ANCHORAGE

A. Single Wythe Joint Reinforcement: Truss type; 9 gage hot dip galvanized. Cold drawn steel wire conforming to ASTM A153 Class B2 (1.5 Oz Zinc coating per square foot).

B. Reinforcing Steel: ASTM A615, 60 ksi yield grade, deformed bars.

C. Strap Anchors: Bent steel shape, hot dip galvanized to ASTM A123.

2.03 MORTAR AND GROUT

A. Mortar and Grout: As specified in Section 04100.

2.04 FLASHINGS

A. Flashings: 7 Oz Copper Fabric as H & B Fab Flashing.

2.05 ACCESSORIES

A. Preformed Control Joints: Neoprene material. Provide with corner and tee accessories, heat fused joints.

B. Joint Filler: Closed cell rubber; oversized 50 percent to joint width; self expanding.

C. Building Paper: No. 15 asphalt saturated felt.

D. Nailing Strips: Softwood, preservative treated for moisture resistance, dovetail shape, sized to masonry joints.

E. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.06 LINTELS

A. As Shown on Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Verify items provided by other sections of work are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied to other Sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COURSING

A. Establish lines, levels, and coursing indicated. Protected from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:

1. Bond: Running.

2. Coursing: One unit and one mortar joint to equal 8 inches.

3. Mortar Joints: Concave.

3.04 PLACING AND BONDING

A. Lay hollow masonry units with face shell bedding on head and bed joints.

B. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.

C. Remove excess mortar as Work progresses.

D. Interlock intersections and external corners.

E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

G. Cut mortar joints flush where wall tile is scheduled, cement paging is required, resilient base is scheduled, or bitumen dampproofing is applied.

H. Isolate masonry partitions from vertical structural framing members with a control joint.

I. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.05 REINFORCEMENT AND ANCHORAGE

A. Install horizontal joint reinforcement 16 inches o.c.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place joint reinforcement continuous in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Support and secure reinforcing bars from displacement. Maintain position within 1/2

inch (13 mm) of dimensioned position.

3.06 LAYING MASONRY WALLS

A. Lay masonry units with core cells vertically aligned clear of mortar and unobstructed.

B. Place mortar in masonry unit bed joints back 1/4 inch from edge of unit grout spaces, bevel back and upward. Permit mortar to cure seven (7) days before placing grout.

C. Reinforce masonry unit cores and cavities with reinforcement bars and grout as indicated.

D. Retain vertical reinforcement in position at top and bottom of cells and at intervals not exceeding 192 bar diameters. Splice reinforcement in accordance with 48 bar diameters.

E. Wet masonry unit surfaces in contact with grout just prior to grout placement.

F. Grout spaces less than 2 inches (50 mm) in width with Fine grout using low lift grouting techniques. Grout spaces 2 inches (50 mm) or greater in width with Course grout using high or low lift grouting techniques.

G. When grouting is stopped for more than one hour, terminate grout 1-1/2 inch below top of upper masonry unit to form a positive key for subsequent grout placement.

H. Low Lift Grouting: Place first lift of grout to a height of 16 inches (400 mm) to three CMU courses and rod for grout consolidation. Place subsequent lifts in 8 inch (200 mm) increments and rod for grout consolidation.

I. High Lift Grouting:

1. Provide cleanout opening no less than 4 inches high at the bottom of each cell to be grouted by cutting one face shall of masonry unit.

2. Clean out masonry cells and cavities with high pressure water spray. Permit complete water drainage.

3. Request inspection of the cells and cavities. Allow 3 days advance notice of inspection.

4. After cleaning and cell inspection, seal openings with masonry units.

5. Pump grout into spaces. Maintain water content in grout to intended slump without aggregate segregation.

6. Limit grout lift to 60 inches and rod for grout consolidation, mechanically vibrate. Wait 30 to 60 minutes before placing next lift.

END OF SECTION 04340

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The Bidding Requirements and Contractual Requirements of Division One shall apply to all work hereunder.

B. Examine other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 SCOPE

A. Provide all concealed blocking, grounds, deadwood, framing and other concealed woodwork, fasteners and related work as indicated on Drawings (for all work required, whether or not specified in additional sections) and specified herein.

B. Provide blocking within or behind all stud walls, and as required at roof accessories and sheet metal applications, all applied or built-in items.

1.03 QUALITY ASSURANCE

A. Fasteners: All woodwork shall be bolted with fasteners of size, spacing and number to develop adequate strength for intended use in compliance with Factory Mutual Prevention Data Sheet 1-49.

B. Pressure Treatment: All wood in contact with masonry or concrete, or exposed to weather, or as may be indicated on Drawings and specified hereinafter shall be pressure treated.

C. No fire treated plywood to be utilized on this project.

PART 2 -PRODUCTS

2.01 GRADING REQUIREMENTS

The following products approved, subjected to compliance with the above specifications.

A. Moisture Content: Maximum 19%.

B. Quality: Lumber must be sound, thoroughly seasoned well manufactured and free from warp that cannot be corrected in process of bridging or nailing.

2.02 GRADES AND SPECIES OF WOOD

A. Grades and species shall be as follows, except where grades and species on Drawings or hereinafter described under specific items shall govern. Lumber and plywood shall be identified by official grade mark.

1. Concealed blocking and framing shall be No. 2 southern yellow pine.

2.03 MISCELLANEOUS MATERIALS

A. Glue and Adhesives

1. Glue for exterior wood use: waterproof.

B. Miscellaneous:

1. Rough hardware, except as indicated otherwise, as required for proper execution of work of this Section, rough hardware and fasteners exposed to weather shall be hot dipped galvanized.

2.04 PRESSURE TREATED

A. Pressure impregnate with wolman salts with arsenic content or acid copper chromate.

B. Retained percentage and method of treatment shall be in accordance with standard specifications of American Wood Preservers Institution for specific species of wood

involved.

C. Accompany lumber with certificate from treatment company certifying treatment amount, moisture percentage after kiln drying.

D. Brush coat surfaces of lumber sawed or cut after treatment with same preservative used at plant.

E. Reduce moisture content after treatment to maximum 19%.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. Provide shape and size required for anchoring items to hollow walls, partitions, and ceilings.

B. Work shall be performed in conformance with good trade practice, recommendations of manufacturers, building codes, and these Specifications, unless specifically indicated otherwise on the Drawings.

C. Fasten securely all parts of rough carpentry work in their proper placed by anchoring and fastening as shown and as required by recognizing standards.

D. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangements.

E. Set carpentry work to required levels and lines, with members plumb and true to line, cut and fitted properly.

F. Countersink nail heads on exposed carpentry work and fill holes.

G. Use common nails, corrosion resistant where necessary, except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required. Use nails and/or other fasteners of proper

material as recommended by manufacturer for all weather treated wood.

3.02 WOOD GROUNDS, NAILERS, BLOCKING AND SLEEPERS

A. Provide wherever shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement. Isolate weather treated wood from metallic substrate using waterproof asphalt impregnated building paper.

C. Provide permanent grounds of dressed, preservative treated, key-bevelled lumber not less than 1-1/2" wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds where no longer required.

3.03 PROTECTION

A. Protect all stored and installed rough carpentry from damage or exposure to heat, moisture or humidity.

B. Take care during installation of any work requiring welded or soldered joints or connections, to prevent any damage, surface charring, etc. to rough carpentry.

3.04 CLEANING

A. Remove all discarded materials daily from workplace. Clean sawdust, discarded fasteners, excess materials, waste, etc. from workplace.

B. Prior to enclosing rough carpentry into finished work, verify that all field cuts or holes have been properly treated as required to maintain integrity of material.

C. Just prior to enclosing-in finish work, thoroughly clean all surfaces, adjacent work, etc. of excess dust, dirt, debris or scrap.

END OF SECTION 06100

SECTION 06410 - CUSTOM CASEWORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Special fabricated cabinet units.

B. Countertops.

C. Cabinet hardware.

1.02 RELATED SECTIONS

A. Section 06100 - Rough Carpentry.

B. Section 15440 - Plumbing Fixtures: Plumbing utilities fixtures.

1.03 REFERENCES

A. ANSI/BHMA A156.9 - Cabinet Hardware.

B. AWI - Quality Standards.

C. FS MM-L-736 - Lumber, Hardwood.

D. FS MMM-A-130 - Adhesive, Contact.

E. National Electric Manufacturers Association (NEMA) LD3 - High Pressure Decorative Laminates.

F. PS 1 - Construction and Industrial Plywood.

G. PS 20 - American Softwood Lumber Standard.

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate materials, component profiles and elevations, assembly

methods, joint details, fastening methods, accessory listings, hardware location, and schedule of finishes.

C. Samples: Submit two (2) 12 x 12 inch size samples, illustrating cabinet finish and construction.

D. Samples: Submit two (2) 12 x 12 inch size samples, illustrating counter top finish and construction.

E. Samples: Submit two (2) samples of drawer pulls, hinges and locks illustrating hardware finish and construction.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with AWI Custom quality.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three (3) years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle products to site under provisions of Section 01600.

B. Protect units from moisture damage.

1.08 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.09 COORDINATION

A. Coordinate the work with plumbing and electrical rough-in and mirror and toilet accessory installation.

PART 2 -PRODUCTS

2.01 WOOD MATERIALS

A. Softwood Lumber: PS 20; graded in accordance with AWI Custom; average moisture content of 8 percent.

2.02 SHEET MATERIALS

A. Softwood Plywood: PS 1; graded in accordance with AWI, core materials of lumber.

ITEM
Shelving

B. Wood Particleboard: PS 1; AWI standard, composed of wood chips, medium density, made with high waterproof resin binders of grade to suit application; sanded faces, located as follows:

ITEM
Door and Drawer Fronts
Drawer Construction

C. Hardboard: Pressed wood fiber with resin binder, tempered grade, 1/4" thick, smooth on sides, located as follows:

ITEM
Drawer Bottoms

2.03 MANUFACTURERS - PLASTIC LAMINATE

A. Formica Corp.

B. Wilsonart.

C. Nevamar.

D. Substitutions: Under provisions of Section 01600.

2.04 LAMINATE MATERIALS

A. Plastic Laminate: NEMA LD3, type, color, patterns, and surface texture to be selected by the Architect.

B. Laminate Backing Sheet: 0.020 inch Backing Sheet grade, undecorated plastic

laminate.

2.05 ACCESSORIES

A. Adhesive: Type recommended by laminate manufacturer to suit application.

B. Fasteners: Size and type to suit application.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application.

D. Concealed Joint Fasteners: Threaded steel.

2.06 HARDWARE

A. Cabinet Shelf Standards and Rests: Knape & Vogt, KV225

B. Wall Shelf Standards and Brackets: Knape & Vogt 87-187.

C. Drawer and Door Pulls: Stainless Steel handles with satin finish EK-S of Sugatsune.

D. Drawer Locks: Knape & Vogt 986.

E. Cabinet Locks: National Cabinet Lock, Cam Lock.

F. Catches: Stanley SP41 and SP45.

G. Drawer Slides: Knape & Vogt KU8400.

H. Hinges: Blum "Clip 110".

I. Interior Gate Hinges: Stanley CD160.

J. Wardrobe lock as Timber Line Lock 1260.

2.07 FABRICATION

A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.

B. Fit shelves, doors, and exposed edges with matching veneer edging. use one piece for full length only.

C. Cap exposed plastic laminate finish edges with material of same finish and pattern.

D. Door and Drawer Fronts: 3/4 inch thick; flush overlay style.

E. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

F. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

G. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.

H. Mechanically fasten back splash to countertops with steel brackets at 16 inches on center.

I. Provide cutouts for plumbing fixtures, appliances, outlet boxes fixtures and fittings and verify locations of cutouts from on-site dimensions. Seal contact surfaces of cut edges.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

A. Set and secure casework in place; rigid, plumb, and level.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Use concealed joint fasteners to align and secure adjoining cabinet units counter tops and base units.

D. Carefully scribe casework abutting other components, with hairline joints. Do not use additional overlay trim for this purpose.

E. Secure base cabinet and counter bases to floor using appropriate angles and anchorages.

F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

A. Adjust work under provisions of Section 01700.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean work under provisions of 01700.

B. Clean casework, counters, shelves, hardware, fittings and fixtures.

END OF SECTION 06410

SECTION 07160 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Cold-applied, asphalt emulsion dampproofing.

1.03 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).

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed bituminous dampproofing similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Single-Source Responsibility: Obtain primary dampproofing materials and primers from one source and by a single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

1.05 PROJECT CONDITIONS

A. Substrate: Proceed with dampproofing only after substrate construction and penetrating work have been completed.

B. Weather Limitations: Proceed with dampproofing only when existing and forecasted

weather conditions will permit work to be performed according to manufacturer's recommendations and warranty requirements.

C. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has thoroughly cured.

PART 2 -PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cold-Applied, Asphalt Emulsion Dampproofing:

a. Sonneborn
b. Euclid Chemical Company
c. Karnak Chemical Corporation
d. Koppers Industries, Inc.
e. Meadows: W.R. Meadows, Inc.

2.02 BITUMINOUS DAMPPROOFING

A. General: Provide products recommended by manufacturer for designated application.

B. Cold-Applied, Asphalt Emulsion Dampproofing: Asphalt-based emulsions recommended by the manufacturer for dampproofing use when applied according to the manufacturer's instructions.

1. Brush Grade: Emulsified asphalt mastic, prepared with mineral-colloid emulsifying agents suitable for application in a relatively thick film, complying with ASTM D 1187, Type I.

2.03 MISCELLANEOUS MATERIALS

A. Primer: Asphalt primer complying with ASTM D 41, for asphalt-based dampproofing.

B. Glass Fabric: Woven glass fabric, treated with asphalt, complying with ASTM D 1668, Type III resin coat.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturer.

B. Install cant strips and similar accessories as shown and as recommended by prime materials manufacturer even though not shown.

C. Fill voids, seal joints, and apply bond breakers, if any, as recommended by prime materials manufacturer, with particular attention at construction joints.

D. Install separate flashings and corner protection stripping, as recommended by prime materials manufacturer, where indicated to precede application of dampproofing. Comply with details shown and with manufacturer's recommendations. Pay particular attention to requirements at building expansion joints, if any.

E. Prime substrate as recommended by prime materials manufacturer.

F. Protection of Other Work: Do not allow liquid and mastic compounds to enter and clog drains and conductors. Prevent spillage and migration onto other surfaces of work by masking or otherwise protecting adjoining work.

3.02 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, below-grade surfaces of exterior concrete or masonry walls in contact with earth or other backfill and where space is enclosed on opposite side.

2. Exterior surface of inside wythe of double-wythe, exterior masonry walls above grade, to prevent water-vapor penetration through the wall.

3. Where indicated on the Drawings.

C. Bituminous Cant Strips: Install 2-by-2-inch (50-by-50-mm) cant strip of bituminous grout at base of vertical dampproofing where it meets horizontal surface.

D. Apply vertical dampproofing down walls from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches (150 mm) over outside face of footing. Extend 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when the Project is

completed.

3.03 COLD-APPLIED, ASPHALT EMULSION DAMPPROOFING

A. Brush apply a coat of asphalt emulsion dampproofing at a rate of 1.5 to 2.5 gal./100 sq. ft. (0.6 to 1 L/sq. m), depending on substrate texture, to produce

a uniform, dry-film thickness of not less than 15 mils (0.4 mm). Apply in 2 coats, if necessary, to obtain required thickness and a no-pin hole finish, allowing time for complete drying between coast.

3.04 PROTECTION AND CLEANING

A. Protect exterior, below-grade dampproofing membrane from damage until backfill is completed. Remove overspray and spilled materials from surfaces not intended to receive dampproofing.

3.05 INSTALLATION OF PROTECTION COURSE

A. General: Where indicated, install protection course of type indicated over completed-and-cured dampproofing treatment. Comply with dampproofing materials manufacturer's recommendations for method of support or attaching of protection materials. Support with spot application of trowel-grade mastic where not otherwise indicated.

END OF SECTION 07160

SECTION 07175 - WATER REPELLENT COATING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The Bidding Requirements and Contractual Requirements of Division One shall apply to all work hereunder.

B. Examine other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 SCOPE

A. Provide water repellent coating and related work for exterior stucco finish and exposed C.M.U. as indicated on Drawings and specified herein.

B. Provide water repellent coating and related work for exterior brick veneer as indicated on drawings and specified herein.

1.03 Contractor Use of Site and Premises:

A. Qualifications of Installer:

1. The water repellent coating installer shall be currently approved by the water repellent coating manufacturer.

2. The actual application of the coating shall be done by competent and skilled workmen completely familiar with the products and manufacturer's recommended methods of installation.

1.04 SUBMITTALS

A. Submit for information only eight (8) copies of manufacturer's product information including installation requirements.

1.05 WARRANTY

A. Furnish manufacturer's standard form of 5 year water repellent coating warranty.

PART 2 -PRODUCTS

2.01 MATERIALS

A. A clear colorless liquid containing 20% isobutyltrialkoxy silane in alcohol

1. Chemtrete - BSM 20
2. Pecora - Klearseal 920-s
3. Prime-A-Pell Plus; Chemprobe Corp.

PART 3 - EXECUTION

3.01 PRECAUTIONS

A. Comply with manufacturer's current printed precautions and as follows:

1. Protect vegetation and surrounding surfaces from overspray and drips.

2. Do not apply if temperature is below 40 degrees F.

3. Provide adequate ventilation when spraying in closed or confined spaces.

3.02 SURFACE PREPARATION

A. Comply with manufacturer's current printed recommendations and as follows:

1. Surfaces shall be clean and free of loose mortar, oils, paint, chemical films. mildew, and rust or other foreign matter.

2. Surfaces must be dry. Do not apply material until four (4) days after rain.

3.03 APPLICATION

A. Following shall conform to manufacturer's recommendations:

1. Spraying equipment

2. Nozzle setting

3. Coverage rates

B. Apply material such that the surfaces to be treated are completely, evenly wet and allowed a flood of material to run down at least twelve (12) inches. Do not over apply until material runs off.

C. After the material has cured, provide another full coat of material, apply clean water, and if any portions of the wall darken, give the area another application of repellent after the water has dried.

D. Clean-up:

1. Overspray or drips on surrounding surfaces shall be cleaned with mineral spirits the day of spraying.

END OF SECTION 07175

SECTION 07190 - MOISTURE BARRIER

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Moisture barrier (vapor barrier) for concrete slabs on grade and shall be provided for concrete slabs installed on prepared earth subgrade.

B. Prepared subgrade is specified in Division 2.

C. Concrete and related materials are specified in Division 3.

1.02 SUBMITTALS

A. Provide samples, manufacturer's product data, test reports, and materials' certifications.

1.03 QUALITY ASSURANCE

A. Codes and Standards: Comply with local governing regulations if more stringent than herein specified.

PART 2 -PRODUCTS

2.01 MATERIALS

A. Moisture Barrier (Vapor Barrier/Retarder): Virgin polyethylene, 6 mil thickness minimum, having a perm rating of 0.5 or less (ASTM E 96, procedure A).

B. Joint Tape: Materials compatible with moisture barrier and approved by the moisture barrier manufacturer.

PART 3 - EXECUTION

3.01 SURFACE PREPARATIONS

A. Remove loose material from compacted subgrade surface before placing moisture

barrier. Do not place moisture barrier until subgrade is in acceptable condition, and sequenced with placement of concrete work.

3.02 MOISTURE BARRIER PLACEMENT

A. Place moisture barrier on the prepared subgrade using full width rolls and placed with a minimum of joints.

B. Lapping: Moisture barrier sheets shall be placed with each sheet overlapping adjacent sheets 6 inches, minimum. End laps shall be same as side laps.

C. Taping: All joints shall be taped their entire length and width using an approved tape.

3.03 PROTECTION

A. Moisture Barrier shall be protected against being dislodged, torn, or otherwise damaged until placement of concrete overburden work.

B. Repair damaged moisture barrier before allowing concrete work to proceed.

END OF SECTION 07190

SECTION 07200 - INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Supplementary conditions and Division 1 specification sections, apply to work of this section

1.02 DESCRIPTION OF WORK

A. Size and extent of insulation work is shown on drawings and indicated by provisions of this section.

B. Applications of insulation specified in this section include the following:

1. Blanket-type building insulation at ceilings.

2. Sound Batt insulation for acoustical purposes in interior all partitions.

3. 1" thick rigid board insulation (exterior walls).

4. Perlite fill insulation. Exterior C.M.U. walls without drywall.

1.03 QUALITY ASSURANCE

A. Thermal Conductivity: Thicknesses indicated are for thermal conductivity (k-value at 75 degrees F or 24 degrees C) specified for each material. Provide adjusted thicknesses as directed for equivalent use of material having a different thermal conductivity. Where insulation is identified by "R" value, provide appropriate thickness required to achieve indicated value.

B. Fire and Insurance Ratings: Comply with fire-resistance, flammability and insurance rating indicated, and comply with regulations as interpreted by governing authorities.

1.04 PRODUCT HANDLING

A. General Protection: Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's

recommendations for handling, storage and protection during installation.

B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.05 STORAGE AND PROTECTION

A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.

PART 2 -PRODUCTS

2.01 MATERIALS

A. Faced Mineral Fiber Blanket/Batt Insulation: Thermal insulation produced by combining mineral fibers of the type described below with thermosetting resins to comply with ASTM C 665 for Type III, Class A (blankets with vapor-retarder membrane facing with flame spread rating of 25 or less); foil-scrim-kraft vapor-retarder membrane on one face, respectively; and as follows:

1. Mineral Fiber Type: Fibers manufactured form glass or slag.

2. Manufacturers: Subject to compliance with requirements, provide products of one of the following:

a) CertainTeed Corp.
b) Manville Corp.
c) Owens-Corning Fiberlass Corp.

B. Mechanical Anchors: Type and size shown or, if not shown, as recommended by insulation manufacturer for type of application and condition of substrate.

C. Sound Blankets: Sound blankets shall be paperless, mineral fiber mat 3-1/2" thick. Fire hazard classification per ASTM E-84, flame spread 25, fuel contributed 0, smoke development 50. To be used in all interior walls.

D. Tape: Two (2) inch wide self-adhering type.

E. Rigid insulation to be 1 inch thick" Thermax" or equal.

F. Perlite insulation at exterior CMU walls as noted on drawing.

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

A. Installer must examine substrate and conditions under which insulation work is to be performed and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with insulation work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

B. Clean substrates of substances harmful to insulations or vapor barriers, including removal of projections which might puncture vapor barriers.

3.02 INSTALLATION

A. General: Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.

B. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

D. General Building Insulation: Apply insulation units to substrate by method indicated complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or used mechanical anchorage to provide permanent placement and support of units.

E. Sound Blankets: Install sound blankets in stud cavities attaching to one (1) base layer of drywall. Attach with staples. Butt ends of blankets closely together and fill all voids. Allow air space between blankets and back of opposite face layer. All

interior walls to have sound batt insulation from floor to 6 inches above ceiling.

3.03 PROTECTION

A. General: protect installed insulation from harmful weather exposures and from possible physical abuses, where possible by non-delayed installation of concealing work or where that is not possible, by temporary covering or enclosure.

END OF SECTION 07200

SECTION 07214 - FOAM-IN-PLACE MASONRY WALL INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Extent of insulation work is shown on drawings and indicated by provisions of this section.

B. Application of insulation specified in this section include the following:

1. Foamed-In-Place masonry insulation for thermal, sound and fire resistance values.

1.02 SUBMITTALS

A. Specification Sheets for Thermco™ foam or equal.

B. Certified Test Reports: With product data, submit copies of certified test reports showing compliance with specified performance values, including R-values, fire performance and sound abatement characteristics.

C. Material Safety Data Sheet: Submit Materia Safety Data Sheet complying with OSHA Hazard Communication Standard, 29 CRF 1910 1200.

1.03 QUALITY ASSURANCE

A. Manufacturing Standards: Provide insulation produced by a single and approved manufacturer. The product must come from the manufacturer pre-mixed to ensure consistency.

B. Installer Qualifications for Foamed-In-Place Masonry Insulation: Engage an experienced dealer/applicator who has been trained and licensed by the product manufacturer.

C. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by a testing agency acceptable to authorities having jurisdiction.

Product must be classified by Underwriters Laboratory ® ("UL") as to Surface Burning Characteristics.

Fire Resistance Ratings:	ASTM E-119
Surface Burning Characteristics:	ASTM E-84
Combustion Characteristics:	ASTM E-136

PART 2 -PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturers of Foamed-In-Place Masonry Insulation: Subject to compliance with requirements, provide products from the following:

1. **Thermco™** Thermal Corporation of America, 1405 West Washington, Mt. Pleasant, IA 52641 (319) 385-1535

2. Or approved equal

2.02 INSULATING MATERIALS

A. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics.

B. Foamed-In-Place Masonry Insulation: Two component thermal insulation produced by combining a plastic resin and catalyst foaming agent surfactant which, when properly ratioed and mixed, together with compressed air produce a cold-setting foam insulation in the hollow unit masonry walls.

1. Fire-Resistance Ratings: Minimum four (4) hour fire resistance wall rating (ASTM E-119) for concrete masonry units when used in standard two (2) hour rated CMUs.

2. Surface Burning Characteristics: Maximum flame spread, smoke developed and fuel contributed of 5, 50-100, and 0 respectively.

3. Combustion Characteristics: Must be noncombustible, Class A building material.

4. Thermal Values: "R" Value of 4.7/inch @ 35 degrees F mean; ASTM C-177.

5. Sound Abatement: Minimum Sound Transmission Class ("STC") rating of 54 for 12" CMU, and 52 for 8" CMU, and a minimum Outdoor Indoor Transmission Class ("OITC") rating of 44 for 8" wall assembly (ASTM E 90 90).

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

A. Application Assemblies:

Block Walls: 8" or 12" concrete masonry units

3.02 INSTALLATION OF FOAMED-IN-PLACE INSULATION

A. General: Install foamed-in-place insulation from interior, or as specified, prior to installation of interior finish work and after all masonry and structural concrete work is in place; comply with manufacturer's instructions.

B. Examiniation: Examine walls and cavitis to determine whether there are conditions that would adversly affect the performance of the insulation. The walls to be insulated must be free of moisture both inside and outside of the block. Insulation is not to be injected into wet walls.

C. Installation: Fill all open cells and voids in hollow concrete masonry walls where shown on drawings. The foam insulation shall be pressure injected through a series of 5/8" to 7/8" holes drilled into every vertical column of block cells (every 8" on center) beginning at an approximate height of four (4) feet from finished floor level. Repeat this procedure at an approximate height of ten (10) feet above the first horizontal row of holes (or as needed) until the void is completely filled. Patch holes with mortar and score to resemble existing surface.

D. Sampling: Verify insulation density by random sampling. One cubic foot of fresh foam shall weigh between 2lbs and 3lbs.6oz.

E. Painting: Allow two weeks after foam installation before painting masonry walls.

END OF SECTION 07214

SECTION 07900 - JOINT SEALERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Preparing substrate surfaces.

B. Sealant and joint backing.

1.02 RELATED SECTIONS

A. Section 08100 - Steel Doors and Frames: Sealants required in conjunction with door frames.

B. Section 08410 - Aluminum Entrances and Storefronts: Sealants required in conjunction with aluminum storefronts.

C. Section 08800 - Glazing: Sealants required in conjunction with glazing methods.

1.03 REFERENCES

A. ASTM C834 - Latex Sealing Compounds.

B. ASTM C920 - Elastomeric Joint Sealants.

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

C. Samples: Submit two samples, 1/4 x 6 inch in size illustrating sealant colors for selection.

D. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, perimeter conditions requiring special attention, and joint backing details.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Maintain one copy of each documents on site.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five (5) years documented experience.

B. Applicator: Company specializing in performing the work of this section with minimum five (5) years documented experience, approved by manufacturer.

1.07 MOCKUP

A. Provide mockup to include sealant joints in conjunction with aluminum storefront system.

B. Construct mockup with specified sealant types and with other components noted.

C. Locate where directed.

D. Mockup accepted by Architect may remain as part of the Work.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.09 COORDINATION

A. Coordinate the Work with all sections referencing this section.

PART 2 -PRODUCTS

2.01 SEALANTS

A. Acrylic Emulsion Latex (Type C): ASTM C834, single component; color as selected.

1. Formulated to be non-sag, paintable.

2. Use for interior joint sealants.

3. Approved manufacturers:

a) Bostik "Chem-Chalk 600".
b) Pecora "AC-20".
c) Sonneborn "Sonolac".
d) Tremco "Tremco Acrylic Latex 834".

B. Polyurethane Sealant (Type G): ASTM C920, Grade NS, Class 25, Use for exterior sealant joints except where specified herein for silicone type; single component, chemical curing, non-staining, non-bleeding, capable of continuous water immersion, non-sagging type; color as selected.

1. Approved manufacturers:

a) Bostik "Chem-Calk 900".
b) Mameco "Vulkem 116".
c) Pecora "Dynatrol 1".
d) Sika "Sikaflex 1A".

C. Silicone Sealant (Type K): ASTM C920, Grade NS, Class 25, Use for exterior sealant joints where both faces are metal, glass or other non-porous material; single component, fungus resistant, acidic curing, non-sagging, non-staining, non-bleeding; color as selected.

1. Approved manufacturers:

a) Bostik "Chem-Calk 1200".
b) Dow "Dow Corning 999A".
c) General Electric "Construction 1200".
d) Pecora Corp. "863".
e) Tremco, Inc. "Proglaze".

2.02 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Continuous length of extruded polyolefin foam with non-absorbing outer skin and resilient interior network of open and closed cells, non-gassing when punctured. Backing shall be sized to 25 percent larger than joint width.

1. Product: SofRod by Applied Extrusion Technologies, Inc. produced by U.S. firms only.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces and joint openings are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials and foreign matter which might impair adhesion to sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions.

D. Protect elements surrounding the Work of this section from damage or disfiguration.

3.03 INSTALLATION

A. Install sealant in accordance with manufacturer's instructions.

B. Measure joint dimensions and size materials to achieve required width/depth ratios.

C. Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.

D. Install bond breaker where joint backing is not used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

G. Tool joints concave, unless otherwise indicated.

3.04 CLEANING

A. Clean Work under provisions of 01700.

B. Clean adjacent soiled surfaces.

3.05 PROTECTION OF FINISHED WORK

A. Protect sealants until cured.

END OF SECTION 07900

SECTION 08100 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work under this section shall include the furnishing of all items shown on the drawings and shall include furnishing door assemblies required to comply with the Miami-Dade Country Product Control Approval System or the Florida Building Code Approval System and as specified, but not limited to, the following:

1. Steel Doors
2. Steel Door Frames
3. Steel Sidelight, Borrowed lite & transom frames
4. Louvers Installed in Steel Doors
5. Insulated metal doors and frames

1.02 RELATED SECTIONS

A. Masonry mortar

B. Steel lintels

C. Finish carpentry

D. Wood Doors and Frames

E. Finish Hardware

F. Glass and Glazing

G. Painting of steel doors and frames

1.03 REFERENCES

A. Steel Doors and Frames in this section shall meet the following standards:

1. American Society for Testing and Materials
2. A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
3. A924 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
4. American National Standards Institute

5. ANSI A250.4 Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcing
6. ANSI A 250.6 Hardware on Standard Steel Doors
7. ANSI A 250.7 Nomenclature for Steel Doors and Steel Door Frames
8. ANSI A250.10 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames
9. DHI 115.1G Installation Guide for Doors and Hardware
10. Door and Hardware Preparation ANSI 115.1.
11. Life Safety Codes NFPA-101 (Latest edition).
12. Fire Doors and Windows NFPA-80 (Latest edition).
13. Steel Door Institute ANSI/SDI-100 (Latest edition)
14. DHI Door and Hardware Institute

B. Insulated doors are tested in accordance with ASTM C236 and SDI 113.

1.04 SUBMITTAL

A. Coordinate approved shop drawings with all other trades and manufacturers whose products are used in conjunction with the Steel Doors and Frames under section 08100.

B. Finish hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Each floor of the building is to be detailed separately.

D. The steel door and frame supplier will furnish to the architect (6) complete copies of the proposed steel door and frames schedule and/or shop drawings. Using the same reference number for details and openings as those on the contract drawings. After receipt of the approved door schedule the steel door and frame supplier will make any corrections submit to the architect (6) sets of corrected schedules, for file and field use.

E. Provide NOA numbers or Certified Test Lab reports showing tested assemblies of all exterior doors, frames and hardware that meet the FBC requirements. Each opening is to be tested as an assembly with doors, frames and finish hardware. Submittal shall include door and frame elevations, internal reinforcements, finish hardware and installation instructions.

F. All door openings including wood, aluminum, overhead etc. must be listed on the steel door schedule. Include details on the following list of items:

1. Frame elevations
2. Door design elevations
3. Frame sections
4. Details of construction
5. Anchorage
6. Opening conditions
7. Joints and connections
8. Hardware locations

G. If any opening is not by the steel door manufacturer only the door opening number should be shown along with the type of material (alum, wood etc.).

H. Only those products specifically listed in Part 2 of this section as approved by manufacturer name and product number are acceptable. Substitutions will not be accepted unless a request is made in writing 10 days, prior to the published bid date and approved by addendum accepting the product substitution. Any manufacturer submitting for approval on must include Certified Testing Reports or NOA numbers specific to the door and frame elevations that meet the FLORIDA BUILDING CODE windload requirements and have been tested as an assembly with the listed approved manufacturers. Submit certified independent lab test or NOA report on each type of exterior opening specified. Only those manufacturers that have tested with this projects door and frame profile, elevations and hardware requirements will be considered.

1.05 QUALITY ASSURANCE

A. Provide Steel Doors and Frames complying with the Steel Door Institute recommended specifications for Standard Steel Doors and Frames ANSI/SDI 100.

B. Underwriters' Laboratories labeled doors and frames shall be manufactured under the UL factory inspection program and in strict compliance to UL procedures, and shall provide the degree of fire protection and, where required, panic loading capability indicated by the opening class.

C. Provide doors, frames and hardware that meets the hurricane and windload test requirements in accordance with the Florida Building code and are in compliance with the local authority having jurisdiction. All openings required to meet either

the impact test or windload test as indicated by the architect shall be tested as systems with the finish hardware, hollow metal doors and frames and installed in accordance with the applicable tests. These requirements take precedence over other requirements. Provide only material that has been tested and listed by local authority for the types and sizes of doors required, and complies with the requirements of the door and door frame

1.06 DELIVERY, STORAGE AND HANDLING

A. All steel doors and frames must be properly marked with door opening mark number to correspond with the schedule.

B. Deliver all the steel doors in cartons and palletized to provide protection during transit and job storage.

C. Inspect doors and frames upon delivery for damage. Minor damage is to be repaired, provided they are equal in all respects to new work and acceptable to the architect.

D. Store doors and frames at the building site under cover. Place units on wood sills or on the floor in a manner that will prevent rust and damage. Avoid the use of non-vented plastic or canvas shelters, which could create a humidity chamber. If the wrapper on the door becomes wet, remove the carton immediately. Provide a 1/4 inch space between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. EXTERIOR OPENINGS: Door assemblies shall resist the cyclic pressures, static pressures and missile impact loads as detailed in Florida Building Code test protocols TAS 201, TAS 202 and TAS 203. Subject to compliance with requirements, and complete assembly testing for the Florida Building Code windload requirements, manufacturers offering products that may be incorporated into the work include the following:

1. Steelcraft Manufacturing Company

B. INTERIOR OPENINGS:

1. Steelcraft Manufacturing Company

2. Ceco Door Products

2.02 HARDWARE LOCATIONS AND GENERAL REINFORCEMENTS

A. Locate hardware on doors and frames in accordance with the manufactures standard location.

B. Steel frames for use with wood doors the hardware preparation on the doors is governed by its location on the frames. If the doors are factory mortised, the door supplier is responsible for coordinating hardware locations.

C. Hardware reinforcements are to be in accordance with the minimum standard gages as listed in SDI-100.

D. Doors shall be mortised, reinforced and function holes provided at the factory in accordance with the hardware schedule and templates provided by the hardware supplier. Through bolt holes, attachment holes, drilling and tapping for surface hardware, shall be done by others.

2.03 STEEL DOORS

A. Materials - Exterior doors and as indicted on the schedule

1. Face sheets shall be 16 gage hot-dipped galvannealed steel having an A60 zinc-iron alloy coating conforming to ASTM designations A653 and A924.
2. Doors shall have continuous vertical mechanical interlocking joints at lock and hinge edges with edge seams filled and ground smooth.
3. Doors shall have hinge and lock edges beveled 1/8" in 2".
4. Top and bottom steel reinforcement channels shall be galvannealed 14 gage, projection welded to both face sheets on 4" centers.
5. Hinge reinforcements shall be 7 gage galvanized steel, projection welded to the edge of the door.
6. Door faces shall be reinforced and sound deadened by resin impregnated Kraft honeycomb core laminated to the inside faces of both panels.
7. Insulated door with polyurethane with U-factor 0.09, R-factor 11.1
8. Acceptable Manufactures:
   Steelcraft Manufacturing - H Series with flush top closure.

B. Materials - Interior doors as indicted on the schedule:

1. Face sheets are to be made of commercial quality Cold rolled steel that complies with ASTM A366 or 620. Grade II - 18ga.
2. Vertical edges are to have continuous vertical mechanical interlocking joints at lock and hinge edges with visible edge seams. The internal portion of the seam shall be sealed with epoxy.
3. Hinge reinforcement shall be not less than 7 gage (3/16") plate 1-1/4" X 9". Approved equal is a 12 gage continuous channel with formed holes drilled and tapped. The manufacture to provide test information that this type reinforcement is equal to a 3/16" or 7 gage plate reinforcement.
4. Reinforce tops and bottoms of all doors with a continuous steel channel not less than 14 gage galvanized A60, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel shall have a steel closure channel screwed in place so that the web of the channel is flush with the face sheets and screwed into the door.
5. Doors shall be reinforced, stiffened, sound deadened and insulated with impregnated kraft honeycomb core completely filling the inside of the doors and laminated to inside faces of both panels using contact adhesive applied to both panels and honeycomb core.
6. Acceptable Manufactures:

    a) Steelcraft Manufacturing - L.
    b) Ceco Door Products - Regent.

2.06 STEEL FRAMES

A. Materials - exterior and as indicted on the schedule.

1. Are to be hot dipped zinc coated steel that complies with ASTM designations A924 A60, 16ga.

2. All frames are to have back welded face seams only of the frame corner or intersection. Grind and dress smooth the weld area. Apply a factory baked on zinc rich primer over the grinding area, and finish with a matching prime paint.
3. Provide steel frames to the size and design as shown on the architectural drawings.
4. Acceptable Manufactures:

    a) Steelcraft Manufacturing - F series

B. Materials all other frames as indicted on the schedule.

1. Are to be hot dipped zinc coated steel that complies with ASTM designations A924 A60, 16ga.Will comply with ASTM A366-68 or ASTM A569-66T, 16ga.
2. All frames are to have back welded face seams only of the frame corner or intersection. Grind and dress smooth the weld area. Apply a factory baked on zinc rich primer over the grinding area, and finish with a matching prime paint.
3. Acceptable Manufactures:

    a) Steelcraft Manufacturing - F series
    b) Ceco Door Products - SF series

C. Fabrication

1. General design and construction

    a) Provide steel frames for doors, transoms, sidelights, borrowed lites, and other openings to the size and design as shown on the architectural drawings.
    b) All finished work to be strong and rigid, neat in appearance, square, true and free of defects.
    c) Jamb depths, trim, profile and backbends to be as scheduled and shown on approved shop drawings.
    d) When shipping limitations so dictate, frames for large openings shall be fabricated in sections designed for splicing in the field by others.
    e) Hardware reinforcements are to be in accordance with the minimum standard gages as listed in SDI-100.
    f) Frames shall be mortised, reinforced, drilled and tapped at the factory for template mortised hardware only, in accordance with approved hardware schedule and template provided by the hardware contractor. Where surface mounted hardware is to be applied, frames shall have reinforcing plates only; all drilling, and tapping shall be done by others.
    g) Hinge reinforcements, to be 7ga steel.

D. Anchors

1. Floor anchors shall be provided at each jamb.
2. Anchors for in masonry are to be of the wire type.
3. Anchors for stud partitions are to be steel of a suitable design, not less than 18ga thickness.

4. Dust boxes/mortar guards to be no less than 26 gage.
5. All frames that are welded, to be provided with a steel spreader temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only not to be used to size the frame opening.
6. Loose glazing stops are to be of 18 gage galvanized at labeled openings and 20 gage galvanized on non-labeled openings, butted at the corner joints and secured to the frame with countersunk cadmium or zinc-plated screws.
7. Provide 3 silencers on single door and 2 silencers for double door openings.

2.07 LABELED DOORS AND FRAMES

A. Construct and install doors and frames to comply with current issue of National Fire Protection Association (NFPA) Standard Number 80, as scheduled.

B. Doors and/or frames for labeled openings are to bear either a stamped or applied label from Warnock Hersey or Underwriters Laboratory

2.08 PRIME FINISH

A. Doors and frames are to be cleaned, and chemically treated to insure maximum finish paint adhesion. All surfaces of the door and frame exposed to view shall receive a coat of rust inhibiting baked on primer applied at the factory. The finish shall meet the requirements for acceptance stated in ANSI A224.1 "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces." The baked on prime finish is not intended to be the final layer of protection from the elements. Field painting using a good grade of paints are to be used in accordance with the recommendations of the door and frame manufacturer. For specialty types of finished coatings, the paint supplier should also be consulted.

PART 3 - EXECUTION

3.01 INSPECTION

A. It is the responsibility of the General Contractor to make sure that all dimensions for existing opening or existing frames (strike height, hinge spacing, hinge back set, etc.) given to the steel manufacturer are accurate.

B. It is the responsibility of the General Contractor to see that any scratches or disfigurements caused in shipping or handling are properly cleaned and touched up with a rust inhibiting primer.

3.02 INSTALLATION

A. Frames

1. Prior to installation, all frames must be checked for rack, twist and out of square conditions.
2. Place frames prior to enclosing walls and ceilings. Set frames accurately in position, plumbed and braced securely until permanent anchors are set.
3. Fill frames in masonry walls with mortar.
4. When temperature conditions necessitate an additive to be used in the plaster or mortar to prevent freezing, the contractor installing the frames will coat the inside of the frames, in the field, with a corrosion inhibiting bituminous material.
5. SDI-105, "Recommended Erection Instructions for Steel Frames" and SDI-110 "Standard Steel Doors and Frames for Modular Masonry Construction" shall indicate the proper installation procedures.

B. Doors

1. Install doors plumb and in true alignment in a prepared opening and fasten them to achieve the maximum operational effectiveness and appearance.
2. Proper door clearance must be maintained in accordance with SDI-110.
3. Where necessary, only metal hinge shims are acceptable to maintain clearances.
4. "Installation Guide for Doors and Hardware" published by DHI is recommended for further details.

C. Hardware must be applied in accordance with hardware manufacturer's templates and instructions.

3.03 ADJUST AND CLEAN

A. Check and re-adjust operating finish hardware items in hollow metal work just prior to final inspection. Leave work in complete and proper condition.

B. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply to touch-up or compatible air-drying primer.

3.04 SCHEDULES

A. After installation, copies of the door schedules will be turned over to the owner when the building is accepted.

END OF SECTION 08100

SECTION 08210 - WOOD DOORS

PART 1 - GENERAL

1.01 WOOD DOORS, NON-RATED AND FIRE-RATED

A. Flush

B. Glazed

C. Louvers

1.02 RELATED SECTIONS

A. Section 06200 - Finish Carpentry.

B. Section 06400 - Architectural Woodwork.

C. Section 08100 - Metal Frames.

D. Section 08700 - Finish Hardware.

E. Section 08800 - Glazing.

F. Section 15910- Door/Transfer Grilles.

1.03 REFERENCES AND REGULATORY REQUIREMENTS

A. ASTM E52-81a - Standard Methods of Fire Tests of Door Assemblies.

B. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 1995 Edition.

C. UL 10B - Fire Tests of Door Assemblies, 9th Edition.

D. UBC 43-2 - Fire Tests of Door Assemblies.

E. NFPA 80 - Fire Doors and Windows.

F. Quality Standards:

1. NWWDA Industry Standard I.S. 1-A-97 (National Wood Window and Door Association).
2. AWI Quality Standards 7th Edition, Version 1.0 1997.
3. ANSI A115. W Series, Wood Door Hardware Standards. (American National Standard Institute).

G. Labeling Agencies:

1. Intertek Testing Services - Warnock Hersey (ITS-WH).

1.04 DOOR DESCRIPTION

A. Interior Doors (Non-Rated)

1. DPC-1, 5-Ply Particle Board Core Door, 1-3/4" (44mm).

B. Interior Doors (Rated)

1. DFM-90, 90 Minute Mineral Core Door, 1-3/4" (44mm), rated by ITS/WH.

1.05 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Illustrate door opening criteria, elevations sizes, types, swings, undercuts, special beveling, blocking for hardware in mineral core doors, identify cutouts.

C. Product Data: Indicate door core materials, thickness, construction, veneer species, cut and matching requirements, factory machining and factory finishing criteria.

D. Construction Samples: Submit one or more of manufacturer's standard samples demonstrating door construction.

E. Finish Samples: A set of (3) illustrating the range of color and grain of the specified door face materials.

F. Manufacturer's Full Lifetime Warranty.

1.06 QUALITY ASSURANCE

A. Meet or exceed NWWDA I.S.1-A Premium Grade and/or AWI Version 7 Custom Grade.

1.07 DELIVERY, STORAGE, HANDLING AND SITE CONDITIONS

A. Deliver, store, protect, and handle products under provisions of NWWDA, AWI and manufacturer's instructions.

B. Accept doors on site in manufacturer's standard packaging. Inspect for damage upon receipt.

C. Do not store in damp or wet areas or in areas where light might cause oxidization.

D. HVAC systems should be operating and balanced prior to arrival of doors. Acceptable humidity shall be no less than 25% nor greater than 55%.

E. Break seal on packages while at site to permit ventilation.

1.08 COORDINATION

A. Coordinate work under provisions of Section 01620.

B. Coordinate the work with door opening construction, door frame and door hardware installation with a pre-installation conference.

1.09 WARRANTY

A. Provide manufacturer's warranty to the following term:

1. Interior Solid Core Doors: "Full Life of Original Installation" including re-hand and refinish if door(s) do not comply with Warranty tolerance standards.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Algoma

B. Eggers

C. Weyerhaeuser Company

2.02 WORKMANSHIP

A. Comply with NWWDA/AWI workmanship for veneer faces, vertical edges, crossbands, horizontal edges and dimensional tolerances.

2.03 MATERIALS

A. Door Construction Grade:

1. Except as may be otherwise shown on the drawings, fabricate the work of this section to NWWDA "Premium Grade/"AWI "Custom Grade".

B. Flush Door Facing, Slice or Cut, Matching, and Finish:

1. Wood Veneer: AWI - A Grade: The veneer species, slice or cut, finish and matching shall be:

a) White maple, plain sliced, book match, clear finish.

C. Doors in Pairs or Sets:

1. Specify per project requirements. Door schedule shall reflect pairs and sets by door numbers.
2. The veneer, slice or cut, finish and veneer matching shall match. Matching between paired doors shall be in a sequence.

2.04 FABRICATION

A. Door and Transom Panel Core Construction:

1. Non-rated: ANSI A208. 1-LD-2 Particle board.
2. 45, 60 or 90 minute Fire-Rated: Mineral Core.
3. Bond stiles and rails to core, abrasive sand core assembly to achieve uniform thickness.

B. Vertical Edges (Stiles):

1. Non-rated:

a) Edges to match face veneer. (May include veneer banding and structural composite lumber backers or inner-plies.)

2. 45, 60, 90 minute rated pairs:

a) Mineral core door stiles to be veneer banded to match faces veneer over manufacturer's edge for improved screw holding. (Metal edges required.)

3. Mineral Core:

a) Mineral core door stiles to be veneer banded to match faces veneer over manufacturer's edge for improved screw holding.

C. Horizontal Edges (Rails):

1. Mill option structural composite lumber or hardwood lumber.

D. Adhesives:

1. Facing Adhesive: Type 1 - Waterproof.

E. Inner-Blocking for Mineral Core Fire Doors:

1. Supply inner-blocking for all surface applied hardware. Through bolts not accepted.

F. Machining for Rated Doors:

1. Factory fit and machine doors for frame and finish hardware in accordance with hardware and NFPA 80 requirements and dimensions. Do not machine for surface hardware. Apply appropriate fire labels.

2.05 ACCESSORIES

A. Louvers:

1. Metal Louvers: Specified in Section 15910

B. Glazing Stops:

1. Non-Rated:

a) Wood, of the same species/compatible with door species, with mitered corners.

2. Fire-Rated:

a) Metal Vision Frames.

2.06 FACTORY FINISH

A. Factory finish doors in accordance with NWWDA G-17 Finish System Description or AWI Division 1500-S-4 - Finish System Standards. Factory

finish to be water based stain and ultraviolet (UV) cured polyurethane sealer to comply with EPA Title 5 guidelines for Volatile Organic Compound (VOC) emissions limitations. Finish must meet or exceed performance standards of TR-6 catalyzed polyurethane. Color shall be a clear finish as specified in Section 2.3.B.

B. Factory finished doors to be installed just prior to substantial completion

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify substrate opening conditions.

B. Verify that opening sizes and tolerances are acceptable and ready to receive this work.

C. Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.

3.02 INSTALLATION

A. Install fire-rated and non-rated doors in accordance with NFPA 80, manufacturers' instructions and fire rated labeling requirements.

B. Trim non-rated door width by cutting equally on both jamb edges.

C. Trim door height by cutting bottom edges to a maximum 3/4 inch (19mm).

D. Trim fire door height at bottom edge only, in accordance with fire rating requirements.

E. Pilot drill screw and bolt holes using templates provided by hardware manufacturer. (Use threaded throughbolts for half surface hinges.)

F. Coordinate installation of doors with installation of frames and hardware.

G. Coordinate installation of glass and glazing.

H. Install door louvers and light kits plumb and level.

I. Reseal or refinish any doors that required site alteration.

3.03 WARRANTY TOLERANCES

A. Conform to NWWDA standards and testing methods for warp, cup, bow and telegraphing.

3.04 ADJUSTING

A. Adjust work under provisions of Division 1.

B. Adjust doors for smooth and balanced door movement.

3.05 DOOR AND FRAME COMPONENTS SCHEDULES

A. Refer to door and frame schedule.

END OF SECTION 08210

SECTION 08360- ALUMINUM SECTIONAL DOORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions, and Division 1 General Requirements, apply to the work of this Section.

1.02 SUMMARY

A. The work of this Section includes upward-acting sectional doors.

B. Related Sections: Other specification sections which directly relate to the work of this Section include, but are not limited to, the following:

1. Section 05500 - Miscellaneous Metal; metal framing and supports.
2. Section 08710 - Finish Hardware; key cylinders for locks.
3. Section 09900 - Painting; field painting.
4. Section 16100 - Electrical; wiring.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each type of sectional door. Include both published data and any specific data prepared for this project.

B. Shop Drawings: Submit shop drawings for approval prior to fabrication. Include detailed plans, elevations, details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent materials.

1.04 QUALITY ASSURANCE

A. Manufacturer: Sectional doors shall be manufactured by a firm with a minimum of five years experience in the fabrication and installation of sectional doors. Manufacturers proposed for use, which are not named in these specifications, shall submit evidence of ability to meet performance and fabrication requirements specified, and include a list of five projects of similar design and complexity competed within the past five years.

B. Installer: Installation of sectional doors shall be performed by the authorized representative of the manufacturer.

C. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

D. Pre-installation Conference: Schedule and convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in labeled protective packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. Provide sectional doors by Overhead Door Corporation, Dallas, Texas; Telephone 800-887-3667 or 214-233-6611; Fax 214-233-0367, or equal.

2.02 ALUMINUM SECTIONAL DOORS

A. Trade Reference: 521 Series Aluminum Doors with wind load 50/75 psf, by Overhead Door Corporation.

B. Sectional Door Assembly: Stile and rail assembly secured with 1/4" diameter through rods. Units shall have the following characteristic:

1. Panel Thickness: 1- 3/4".
2. Aluminum panels: 0.050" thick alloy 6063-T6.
3. Springs: 50,000 to 100,000 cycles. (High cycles.)
4. Glazing: Lexan 1/4" glazing
5. Bottom panel to be vented. Provide insect screen on this panel.
6. Track: 3" Track.

C. Finish and Color:

1. Manufacturer's standard white.

D. Windload Design: ANSI/DASMA 102 standards and as required by code.

E. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.

F. Lock: Interior galvanized single unit.

G. Weatherstripping: Flexible PVC on bottom section; Jamb seals and Header seal.

H. Track: Provide 3" lift track or as recommended by manufacturer to suit loading required and clearances available (minimum 3" lift track).

I. Electric Motor Operation: Provide UL listed electric operator, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second.

1. Entrapment Protection: Photoelectric sensors. Electric sensing edge.
2. Operator Controls: Push button operated control stations with open, close and stop buttons for mounting for interior locations in NEMA 4 Case.
3. Special Operations: Radio control operation, photocell operation and commercial light package.
4. Floor disconnect for electric opener.

PART 3 - EXECUTION

3.01 PREPARATION

A. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are correct.

3.02 INSTALLATION

A. Strictly comply with manufacturer's installation instructions and recommendations. Coordinate installation with adjacent work to ensure proper procedures clearances and allow for maintenance.

B. Instruct Owner's personnel improper operating procedures and maintenance schedule.

3.03 ADJUSTING AND CLEANING

A. Test sectional doors for proper operation and adjust as necessary to provide proper operation without binding or distortion.

B. Touch-up damaged coatings and finishes and repair minor damage. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer of material or product being cleaned.

END OF SECTION 08360

SECTION 08361- MOTORS OPERATORS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide electric door operators of size and capacity for doors as recommended by door manufacturer with electric motor factory pre-wired motor controls, starter, gear-reduction unit, drum brake, clutch, control devices, and accessories required for proper operation.

1.02 RELATED WORK

A. Opening preparation, miscellaneous or structural metal work, access, field electrical wiring, wire, conduit, fuses and disconnect switches are in the Scope of Work of other divisions or trades.

1.03 QUALITY ASSURANCE

A. In accordance with accepted quality assurance guidelines for motor-operated doors, both the door and electric operator shall be manufactured by a single source producer of door systems, such as by Overhead Door Corporation or equal

PART 2 - PRODUCTS

2.01 GENERAL

A. The electric door operator shall be the standard-duty Model T by Liftmaster door control system for standard-lift doors as manufactured by Overhead Door Corporation or equal and suitable for the type and size of door specified.

2.02 MOTOR

A. Motor shall be 3/4 horsepower continuous duty, with instant reverse and automatic reset thermal overload. Motor shall be UL listed. Motor shall comply with NEMA 56, open drip-proof construction.

2.03 REDUCTION

A. Primary reduction is 6-rib poly J-belt and pulley. Secondary reduction is by chain and sprocket. All moving shafts shall incorporate ball bearings.

2.04 DUTY CYCLE

A. Duty cycle shall accommodate standard usage, up to 60 cycles per hour during peak usage.

2.05 CLUTCH

A. Clutch shall be adjustable disc type.

2.06 BRAKE

A. Brake shall be solenoid actuated, drum and shoe type standard on 3/4 horsepower trolley units.

2.07 LIMIT SYSTEM

A. Limit system shall be rotary type with vernier adjustment, synchronized with door during release operation.

2.08 CONTROL SYSTEM

A. Control system shall use a heavy-duty reversing contractor, electrically and mechanically interlocked with 24 VAC three-button open/close/stop control that allows for constant or momentary contact door open and door close functions. System shall also accommodate connection of a sensing edge and photcell device; and connection of push button control stations; and connection of three-wire radio controls.

2.09 MOUNTING

A. Mounting shall be by trolley.

2.10 RELEASE

A. Release shall consist of a manual disconnect door arm on trolley units.

2.11 ENTRAPMENT PROTECTION

A. An external reversing device and a Fail Safe electric sensing edge that will not allow the door to close if the sensing edge is damaged or not working properly are required.

B. The control system shall have provisions to connect such entrapment protection devices, electric sensing edge, photoelectric sensor and to provide

constant contact control operation in lieu of such devices.

2.12 ACCESSORIES (OPTIONAL)

A. Control Accessories: In addition to interior push-button control stations, radio control systems, photo-electric controls, timer to close controls, vehicle detector controls and warning light controls.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The electric motor operators shall be installed in accordance with overhead door manufacturer's instructions and standards. Installation will be by authorized overhead door manufacturer's representatives.

END OF SECTION 08361

SECTION 08410 - ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Exterior aluminum doors and frames.

B. Frames for exterior fixed windows.

C. Frames for glazed interior openings.

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 08710 - Door Hardware: Hardware items other than specified in this section.

1.03 RELATED SECTIONS

A. Section 07900 - Sealants: System perimeter sealant and back-up materials.

B. Section 08710 - Door Hardware: Mortised hardware reinforcement requirements affecting framing members.

C. Section 08800 - Glazing.

1.04 REFERENCES

A. AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

B. AAMA 605.2 - Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.

C. ANSI/ASTM A36 - Structural Steel.

D. ANSI/ASTM A386 - Zinc Coating (Hot Dip) on Assembled Steel Products.

E. ANSI/ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

F. ANSI/ASTM B221 - Aluminum-Alloy Extruded Bar, Rod, Wire, Shape and Tube.

G. ANSI/ASTM E283 - Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.

H. ANSI/ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

I. ANSI/ASTM E331 - Test Method for Water Penetration of Exterior Window, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

J. SSPC - Steel Structures Painting Council.

1.05 SYSTEM DESCRIPTION

A. Aluminum entrances and storefront system includes tubular aluminum sections with supplementary internal support framing, shop fabricated, factory pre-finished, related flashings, anchorage and attachment devices.

1.06 PERFORMANCE REQUIREMENTS

A. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall to a design pressure of 24 lb/sq ft as measured in accordance with ANSI/ASTM E330.

B. Limit mullion deflection to flexure limit of glass with full recovery of glazing materials.

C. System to accommodate, without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads, deflection of structural support framing.

D. Limit air leakage through assembly to 0.06 cfm/min/sq. ft. of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ANSI/ASTM E283.

E. Water Leakage: None, when measured in accordance with ASTM E331 with a test pressure difference of 2.86 lb/sq ft.

F. Maintain continuous air and vapor barrier throughout assembly.

G. System to provide for expansion and contraction within system components caused by a cycling temperature range of 120 degrees F over a 12 hour period without

causing detrimental affect to system components.

H. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.

1.07 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work and expansion and contraction joint location and details.

C. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, and internal drainage details.

D. Submit two samples 12 x 12 inches in size illustrating pre-finished aluminum surface. Where color or texture variations are anticipated, include two (2) or more units in each set of samples indicating extreme limits of variation.

E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.08 QUALITY ASSURANCE

A. Perform Work in accordance with AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

1.09 QUALIFICATIONS

A. Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems with minimum three years documented experience.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect pre-finished aluminum surfaces with wrapping or stripable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.11 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

PART 2 -PRODUCTS

2.01 MANUFACTURERS

A. Storefront specified herein based on that by Kawneer Company, Inc. equal as approved by the Architect by the following will be acceptable.

B. Other acceptable manufacturers offering equivalent Products:

1. Amarlite Architectural Products.
2. PPG Industries.
3. Vistawall Architectural Products.

2.02 MATERIALS

A. Extrusions: ASTM B 221 (ASTM B 221M), 6063 -T5 Aluminum Alloy.

B. Sheet Aluminum: ANSI/ASTM B209.

C. Steel Sections: ASNI/ASTM A36; shaped to suit mullion sections.

D. Fasteners: Stainless steel.

E. Shop and Touch-Up Primer for Steel Components: SSPC 15, Type 1, red oxide.

2.03 COMPONENTS

A. Frame: 1-3/4" x 4-1/2" nominal dimension; flush glazing stops; drainage holes; internal weep drainage system.

B. Reinforced Mullion: 1-3/4" x 4-1/2" nominal dimension; profile of extruded aluminum with internal reinforcement of shaped steel structural section.

C. Doors: 1-3/4" thick, 3-1/2" top rail, 3-1/2" vertical stile, 6-1/2" bottom rail square glazing stops. See drawings for dimensional information of door.

D. Flashing: .040 inch thick aluminum, finish to match mullion sections where exposed.

2.04 GLASS AND GLAZING MATERIALS

A. Glass and Glazing Materials: As specified in Section 08800.

2.05 SEALANT MATERIALS

A. Sealant and Backing Materials: As specified in Section 07900 of Types described below.

B. Spacer Shims: Neoprene, 50-60 Shore, A durometer hardness, minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

1. Perimeter Sealant: Type polyurethane
2. Sealant Used Withing System (Not Use for Glazing): Type silicone.

2.06 HARDWARE: Finish of hardware items to match storefront frames.

A. Weather Striping Wool pile, continuous and replaceable.

B. Threshold: Extruded aluminum, one piece per door opening, non-slip surface.

C. Push/Pulls: Kawneer CP push/pull.

D. Closers: LCN 4040.

2.07 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Arrange fasteners and attachments to conceal from view.

E. Prepare components with internal reinforcements for door hardware.

F. Reinforce framing members for imposed loads.

2.08 FINISHES

A. Exterior and interior finish to powder coating. Provide AMA.605.2 power coating as Kawneer Interpon D.200 or equal. Submit samples for approval prior to ordering.

B. Concealed Steel Items: Galvanized in accordance with ANSI/ASTM Z386 to 2.0 oz/sq. ft.

C. Apply one coat of bituminous paint to concealed aluminum and steel surfaces

in contact with cementitous or dissimilar materials.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other Work.
B. Verify wall openings and adjoining materials are ready to receive Work of this Section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions and AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide to Specifications Manual.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent Work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill and head flashings.

G. Coordinate attachment and seal of perimeter air and vapor barrier materials.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of mastic and secure.

J. Install hardware using templates provided.

K. Install glass in accordance with Section 08800, to glazing method required to achieve performance criteria, dry method of glazing.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft. non-cumulative or 1/16 inches per 10 ft., whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 ADJUSTING

A. Adjust operating hardware for smooth operation.

3.05 CLEANING

A. Clean Work under provisions of 01700.

B. Remove protective material from pre-finished aluminum surfaces.

C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

D. Remove excess sealant by method acceptable to sealant manufacturer.

3.06 PROTECTION OF FINISHED WORK

A. Protect finished Work from damage.

END OF SECTION 08410

SECTION 08520 - ALUMINUM SINGLE HUNG WINDOW

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide all labor material, tools and equipment to furnish windows and related components as shown on drawings and specified herein and in accordance with the contract documents.

B. Furnish and install any supplementary or miscellaneous items, devices or material incidental to or necessary for a sound, secure and complete installation, although such work might not be specially indicated.

C. Refer to Division 1 for general requirements.

1.02 QUALITY ASSURANCE

A. General

1. Provide AAMA/NWWDA 101/1.S.2-97 notice of product certification in full accordance with the following:

a. Aluminum Single Hung Window to be Egress Window as specified in window schedule.

2. Test sequence is optional except air infiltration test shall precede water resistance test and uniform load structural test shall be performed at the end of sequence.

B. Test Units

1. Perform all tests as listed below in accordance with AAMA/NWWDA101/1.s.2-92.

C. Test Procedures

1. Air Infiltration Test - Lab Test

a. With window glazed, sash closed and locked, mounted vertically, test

in accordance with ASTM E283-91 at a static pressure of 1.57 psf (25 mph). Air infiltration shall not exceed maximum 0.15 cfm per lineal foot of crack of window assembly (or 0.07 cfm per square foot of window assembly area).

2. Water Resistance Test - Lab Test

   a. With window glazed, sash closed and locked, mounted vertically, test in accordance with ASTM E547-93 at the static pressure of 7.50 psf. There shall be no uncontrolled water leakage as defined in ASTM E547-93.

3. Uniform Load Test - Design Wind Load Lab Test

   a. With window glazed, sash closed and locked, mounted vertically in accordance with ASTM E330-90.
   b. There shall be no glass breakage, permanent damage to fasteners or hardware parts, or damage to make window or door inoperable when tested at a design load of positive and negative 50 psf.

4. Uniform Load Structural Test - Overload Lab Test

   a. With window glazed, sash closed and locked, mounted vertically in accordance with ASTM E330-90.
   b. When tested at positive and negative 75 psf, there shall be no glass breakage, permanent damage to fasteners or hardware parts, damage to make window or door inoperable, or permanent deformation of any main frame or ventilator section in excess of 0.4% of its unsupported span.

1.03 REFERENCES

A. Window and door material Test Standards.

1. AAMA (American Architectural Manufacturers Association).

   a. AAMA - 'Architectural Aluminum Window Selection Guide Manual'.
   b. AAMA CW #10-82 - 'Care and Handling of Architectural Aluminum from Shop to Site'.
   c. AAMA/NWWDA 101/1.s.2-97 Voluntary Specifications for

Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.

2. ASTM (American Society of Testing Materials).

   a. ASTM E283-91 - 'Test for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors'.

   b. ASTM E331-93 - 'Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference'.
   c. ASTM E330-90 - 'Test for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference'.
   d. ASTM E774-92 - 'Specification for Sealed Insulating Glass Units'.
   e. ASTM C1048-92 - 'Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass'.
   f. ASTM C1036-91 - 'Specification for Flat Glass'.

3. ANSI (American National Standards Institute).

   a. ANSI 297,.1 1984 - 'American National Standard Performance Specifications and Methods of Test for Safety Glazing Material, Used in Buildings'.

4. ISWA (Insect Screen Weavers Association)

   a. ANSI/IWS 089-1990 'Recommended Standard and Specifications for Insect Wire Screening (Wire - Fabric).

1.04 SUBMITTALS

A. Shop Drawings

1. Furnish complete and legible drawings showing Window Schedule, full size details, and the results of all field measurements. Show all metal-to-metal sealing details. Indicate all adjustments made as a result of field-testing.
2. Show all components with dimensions, materials and details of anchoring and fastening.
3. Show finishes, sealant brands and all other information indicating compliance with specifications.

B. Samples

1. Color range samples of anodized aluminum finishes.
2. Color Samples o f organic finishes.
3. Samples of metal, glass, fasteners, anchors, etc.

C. Calculations

1. Submit test results or necessary engineering calculations for approval

purposes to indicate adequacy of all installed materials to withstand the Design Load requirements as specified in Section 1.03, Paragraph C, Subparagraphs 3 and 4.

D. Independent laboratory test reports verifying all requirements as specified in 1.03.

E. Warranties

1. Submit samples of written warranty indicating compliance with contract documents. Warranties shall be transferable and not prorated.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protection

1. Materials shall be packed, unloaded, stored and protected to avoid abuse, damage and defacement from any source in accordance with recommendations contained in the AAMA Aluminum Curtain Wall Manual #10, 'Care and Handling of Architectural Aluminum from Shop to Site'.
2. When unloading, remove any paper type wrapping or interleaving that is wet or which could become wet.
3. Store inside if possible in a clean well drained area free of dust and corrosive fumes.
4. Stack vertically or on edge so that water cannot accumulate on or within materials, using wood or plastic shims between components to provide water drainage and air circulation.
5. Cover materials with tarpaulins or plastic hung on frames to provide air circulation and prevent contaminants from contacting aluminum.
6. Keep water away from stored assembles.
7. It is the contractor's responsibility during and after installation to protect material from lime, mortar, run-off from concrete and copper, careless handling of tools, weld splatter, acids, roofing tar, solvents and abrasive cleaners.

1.06 GUARANTEES & WARRANTIES

A. Window Installation

1. Total System

a. The window installer shall assume full responsibility that the installation is in accordance with the specifications, contract documents and the manufacturer instructions and/or approved shop drawings.

b. All sealed insulated glass shall be warranted by the manufacturer against failure of the air seal for a period of ten (10) years from date of manufacture.

c. The window manufacturer shall assume full responsibility and warrant for a period of two (2) years from the date of manufacturer:

(I) the aluminum extrusions, parts and materials used to be new and free from defects in material and workmanship.

(ii) screens and moving parts used to be new and free from defects in material and workmanship.

(iii) product performance as related to air and water infiltration and structural integrity shall be in accordance with manufacturer's specifications and/or approved shop drawings.

d. Any element of the above that does not meet the specification criteria shall be corrected by the responsible sub-contractor.

PART 2 - PRODUCTS

2.01 ALUMINUM SINGLE HUNG WINDOW

A. Manufacturer - Nuair, Tampa, FL or equal.

1. Nuair Series 900 & 950 SH.

2.02 MATERIAL

A. Aluminum Single Hung Window

1. Extruded aluminum shall be 6063-T5.

B. Hardware - General

1. Hardware such as locking handles, cases, keepers, latches, fasteners, etc. shall be made from material that is corrosion resistant as well as compatible with aluminum and must have proven its strength and suitability for use by being installed on test units referenced in this specification.

C. Anchors and Fasteners

1. Fasteners: Provide aluminum, nonmagnetic stainless steel, epoxy adhesive or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum window members, trim hardware, anchors, and other components of window units.

   a. Reinforcement: Where fasteners screw anchor into aluminum less than 0.125 inch (3.2 mm) thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw, threads or provide standard, non-corrosive, pressed-in, splined grommet nuts.
   b. Exposed Fasteners: Except where unavoidable, do not exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.

2. Anchors, Clips and Window Accessories: Fabricate anchors, clips and windows accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel or iron complying with requirements of ASTM B 633; provide sufficient strength to withstand design pressure indicated.

D. Sealant (Refer to Section 07900)

1. Materials used within window or door assemblies to seal metal to metal non-working joints shall comply with AAMA 803.3-92.
2. Sealing materials used between windows or doors and window or door components to be suitable for the application as specified and approved by window manufacturer.

E. Weather-strip

1. Materials - Only high quality materials proven to be capable of meeting the environmental exposure and performance requirements shall be used in weather-strip applicators. When the following materials are used, they should meet the specifications indicated.
2. Pile weather-strip shall conform to AAMA 701-92.
3. Weather-strip of closed cell elastomer shall meet ASTM C 509 or AAMA 702-92.
4. Weather-strip of dense elastomer shall meet ASTM C 864-93 or AAMA 702-92.

F. Glass and Glazing

1. Glass

a. Size and type as indicated on shop drawings as described in Section 08800.
b. Safety glazing materials, where used, shall meet Z 97, 1-1984, or CPSC-16 CRF 1201-1986. Tempered glass, where used, shall meet ASTM C-1048-92.
c. Tempered glass, where used, shall meet ASTM C 1048-92.
d. Glass shall meet or exceed the values shown in the Glass Table for the required Design Pressure. Tabulated areas may be increased as noted for use of tempered, heat-strengthened, or insulated glass as noted in the Glass Tables.

2. Glazing Material

a. Glazing gaskets shall be of material compatible with aluminum and those sealants and sealing materials used in composite structures, which are in direct contact with the gasket. The gasket shall be resistant to weathering and maintain a water-resistant seal between the glass and the surrounding frame. Gaskets shall have .250" diameter weep holes approximately six inches on center whenever insulated glass is utilized.
b. Back-bedding material using either interior or exterior face stops shall meet AAMA 805.2-92 for the back-bedding compounds, or AAMA 806.3-92 for back bedding glazing tapes.

2.03 FABRICATION

A. General

1. Fabricate and assemble from and sash members into windows and window systems in accordance with approved drawings.

B. Finish

1. Material: The coating shall be a thermal setting acrylic polymer or a high solids polyester baked to a hard, light resistant, and chemical resistant film. It is pigmented to the desired color with light fast pigments.
2. Pre-Treatment: All aluminum surfaces will be prepared to receive the coating as follows:

   a. Alkaline cleaning up to 160 degree Fahrenheit.
   b. Rinse using clean, continuously running cold water.
   c. Conversion coating.
   d. Rinse using clean, continuously running cold water.

   e. Acidulated rinse or hot water rinse.
   f. Dry with forced hot air.

3. Application: The coating will be Electro-Statically applied with specially designed rotating discs. The finish will be supplied in such a manner to assure a continuous, homogeneous coating having a dry film thickness of 0.8 mils, minimum.
4. Curing: Following application, the coating will be cured in a convection oven by baking to a temperature and time as recommended by the paint manufacturer.

5. Performance:

   a. Paint finish shall meet or exceed AAMA specification 603.B-92.
   b. Paint finish shall be resistant to sunlight, oxidation, salt air, and chemicals such as dilute acids, alkalines and detergents.
   c. Humidity Resistant: There shall be no blistering or corrosion after 1,000 hours at 100% relative humidity and 110 degree Fahrenheit.
   d. Salt Spray Resistant: No corrosion, blistering, dulling, or score line failure after 1,000 hours salt spray test in accordance with ASTM B-117 or Federal Standard 141 method 6061.

6. Color: All exposed aluminum shall be painted whit as chosen by the

architect.

PART 3 - EXECUTION

3.01 INSPECTION

A. Job Conditions

1. General Contractor to verify that openings are plumb, level and in full accordance with approved shop drawings and that openings provide a solid anchoring substrate.
2. Do not install windows until all conditions are satisfactory.
3. Installation constitutes acceptance of responsibility.

3.02 INSTALLATION

A. Windows and Associated Components

1. Use only skilled tradespeople to perform all work done in full

accordance with approved shop drawings and project specifications.

2. Plumb and align window faces in a single plane for each wall plane and erect windows and materials square and true. Anchors and fasteners are to be designed to withstand Design Wind Loads and be able to accommodate normal building movements as well as differential movements due to thermal expansion and contraction.
3. Adjust operating sash for proper operation after installation.
4. Furnish and apply sealant with bond-breakers or backer rods as necessary to provide a weather-tight installation at all joints, intersections, and at opening perimeters. Wipe off excess material and leave all exposed surfaces and joints clean and smooth.
5. Glass and glazing shall conform to, and be set in accordance with the approved shop drawings and project specifications to provide a satisfactory and leak-free installation.
6. Install vapor barrier materials and/or insulation between window perimeter and adjoining collateral materials and/or existing wall framing to avoid compromising the performance of the installation.
7. Aluminum shall not come into direct contact with steel, masonry, concrete

or non-compatible materials. Where unavoidable, installer shall isolate aluminum form these materials using bituminous paint, zinc chromate primer or other suitable insulating materials.

3.03 ADJUSTING AND CLEANING

A. After completion of installation, windows shall be inspected, adjusted, put into working order and left clean, free of labels, dirt, etc. Protection from this point shall be responsibility of others.

B. Final clearing shall be by others.

END OF SECTION 08520

SECTION 08710 - FINISH HARDWARE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work in this section shall include furnishing of all items of finish hardware as hereinafter specified or obviously necessary to complete the building, except those items that are specifically excluded from this section of the specification.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Hollow Metal Doors and Frames.

B. Aluminum Doors and Frames

C. Wood Doors and Frames

D. Insulated Metal Doors and Frames.

1.03 DESCRIPTION OF WORK

A. Furnish labor and material to complete hardware work indicated, as specified herein, or as may be required by actual conditions at building.

B. Include all necessary screws, bolts, expansion shields, other devices, if necessary, as required for proper hardware application. The hardware supplier shall assume all responsibility for correct quantities.

C. Hardware shall meet the requirements of Federal, State and Local codes having jurisdiction over this project, notwithstanding any real or apparent conflict therewith in these specifications.

D. Fire-rated openings:

1. Provide hardware for fire-rated openings in compliance with A.I.A. (NBFU) Pamphlet No. 80, NFPA Standards NO. 101, UBC 702 (1997) and UL10C. This requirement takes precedence over other requirements for such hardware. Provide only hardware that has been tested and listed by UL for the types and sizes of doors required, and complies with the requirements of the door and door frame labels.

2. Where panic exit devices are required on fire-rated doors, provide supplementary marking on door UL label indicating Fire Door to be equipped with fire exit hardware and provide UL label on exit device indicating "Fire Exit Hardware".

E. Fasteners:

1. Hardware as furnished shall conform to published templates generally prepared for machine screw installation.
2. Furnish each item complete with all screws required for installation. Typically, all exposed screws installation.
3. Insofar as practical, furnished concealed type fasteners for hardware units that have exposed screws shall be furnished with Phillips flat head screws, finished to match adjacent hardware.
4. Door closers and exit devices to be installed with closed head through bolts (sex bolts).

F. Exterior openings

1. Provide hardware for hurricane openings in compliance with local jurisdiction. This requirement takes precedence over other requirements for such hardware. Provide only hardware that has been tested and listed by local authority for the types and sizes of doors required, and complies with the requirements of the door and door frame. Coordinate Section (08710) Finish Hardware with the Hollow Metal Doors and Frames (08110) and Aluminum Doors and Frames (08210).

1.04 QUALITY ASSURANCE

A. The supplier to be a directly franchised distributor of the products to be furnished and have in their employ an AHC (Architectural Hardware Consultant). This person is to be available for consultation to the architect, owner and the general contractor at reasonable times during the course of work.

B. The finish hardware supplier shall prepare and submit to the architect six (6) copies of a complete schedule identifying each door and each set number, following the numbering system and not creating any separate system himself. He shall submit the schedule for review, make corrections as directed and resubmit the corrected schedule of final approval. Approval of schedule will not relieve Contractor of the responsibility for furnishing all necessary hardware, including the responsibility for furnishing correct quantities.

C. No manufacturing orders shall be placed until detailed schedule has been submitted to the architect and written approval received.

D. After hardware schedule has been approved, furnish templates required by manufacturing contractors for making proper provisions in their work for accurate fitting, finishing hardware setting. Furnish templates in ample time to facilitate progress of work.

E. Hardware supplier shall have an office and warehouse facilities to accommodate the materials used on this project. The supplier must be an authorized distributor of the products specified.

F. The hardware manufacturers are to supply both a pre-installation class as well as a post-installation walk-thru. This is to insure proper installation and provide for any adjustments or replacements of hardware as required.

1.05 DELIVERY, STORAGE AND HANDLING

A. Wrap, protect finishing hardware items for shipment. Deliver to manufacturing contractors hardware items required by them for their application; deliver balance of hardware to job; store in designated location. Each item shall be clearly marked with its intended location.

1.06 WARRANTY

A. The material furnished shall be warranted for one year after installation or longer as the individual manufacturer's warranty permits.

B. The manufacturer against failure due to defective materials and workmanship shall warrant overhead door closers in writing for a period of ten (10) years. Commencing on the Date of Final Completion and Acceptance, and in the event of failure, the manufacture is to promptly repair or replace the defective with no additional cost to the Owner.

PART 2 -PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. To the greatest extent possible, obtain each kind of hardware from only one manufacturer.

B. All numbers and symbols used herein have been taken from the current catalogues

of the following manufacturers.

	PRODUCT	ACCEPTABLE MANUFACTURER	ACCEPTABLE SUBSTITUTE
1.	Hinges	Ives	Hager, Stainley, Bommer
2.	Locks & Latches	Schlage	None (No Substitution)
3.	Cylinders, Keys & keying	Schlage Everest	None (No Substitution)
4.	Exit Devices	Von Duprin	None (No Substitution)
5.	Door Closers	LCN	None (No Substitution)
6.	OH Stops/Holders	Glynn Johnson	Rixson
7.	Push Button Access	Schlage	None (No Substitution)
8.	Wall Stops/Floor Stops, Flushbolts	Ives	Rockwood, G-J
9.	Kick Plates	Ives	Rockwood, Quality
10.	Threshold/Weatherstrip	National Guard	Pemko, Reese
11.	Silencers	Ives	G-J, Rockwood
12.	Key Cabinet	Lund	Key Control

C. If material manufactured by other than that specified or listed herewith as an equal, is to be bid upon, permission must be requested from the architect seven (7) days prior to bidding. If substitution is allowed, it will be so noted by addendum.

2.02 FINISH OF HARDWARE

A. Exterior Hinges to be Stainless Steel (32D), Interior Hinges to be Satin Chrome (26D). Door Closers to be Aluminum. Locks to be Satin Chrome (26D), Exit Devices to be Satin Chrome (26D). Overhead Holders to be Satin Chrome (26D), Flat Goods to be Satin Chrome (26D) or Stainless Steel (32D) and the Thresholds to be Mill Finish Aluminum

2.03 HINGES AND PIVOTS:

A. Exterior butts shall be Stainless Steel. Butts on all out swinging doors shall be furnished with non-removable pins.(NRP).

B. Interior butts shall be as listed.

C. Doors 5' or less in height shall have two (2) butts. Furnish one (1) additional butt for each 2'6" in height or fraction thereof. Dutch door shall have two (2) butts per leaf.

2.04 KEYING:

A. Equip locks and cylinders with patent protected key section, full size "Everest"

cylinders with nickel silver blocking pin to check for patented feature on keys.

B. Provide a minimum of 6 pins with nickel silver bottom pins. Cylinders must allow for multiplex master keying, combinated to Owner's instructions. All bittings shall be issued by lock manufacture.

C. Provide Two (2) each change keys per lock and Six (6) each grand master, master keys, two (2) construction and two (2) permanent control keys. All keys to be Patent Restricted.

D. Hardware supplier to provide temporary cylinders or cores during the construction phase. The contractor is to change out the temporary cylinders for the permanent cylinders.

2.05 LOCKSETS:

A. Locksets shall be Heavy Duty Cylindrical type, unless specified otherwise, in "ND" Series, Design as manufactured by Schlage.

1. Acceptable substitutions:
   a. None (No Substitution)

2.06 EXIT DEVICES:

A. Exit devices shall be Von Duprin 98 Series in types and functions specified. All devices must be listed under "Panic Hardware" in accident equipment list of Underwriters Laboratories. All labeled doors with "Fire Exit Hardware" must have labels attached and be in strict accordance with Underwriters Laboratories

B. Exit devices shall be tested to ANSI/BHMA A156.3 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 1,000,000 cycles must be provided.

C. Surface strikes shall be roller type and come complete with a plate underneath to prevent movement. And shall be provided with a dead-latching feature to prevent latchbolt tampering.

1. Acceptable substitutions;
   a. None (No Substitution)

2.07 DOOR CLOSERS:

A. Closers shall be LCN 1461 Series having non-ferrous covers, forged steel arms separate valves for adjusting backcheck, closing and latching cycles and adjustable spring to provide up to 50% increase in spring power. Closers shall be furnished

with parallel arm mounted on all doors opening into corridors or other public spaces and shall be mounted to permit 180 degrees door swing wherever wall conditions permit. Furnish with non-hold open arms unless otherwise indicated.

B. Door closer cylinders shall be of high strength cast iron construction to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.

C. Door closers shall utilize temperature stable fluid capable of withstanding temperature ranges of 120 degrees Fahrenheit to -30 degrees Fahrenheit, without requiring seasonal adjustment of closer speed to properly close the door. Closers for fire-rated doors shall be provided with temperature stabilizing fluid that complies with the standards UBC 7-2 (1997) and UL 10C.

D. Door closers shall incorporate tamper resistant non-critical screw valves of V-slot design to reduce possible clogging from particles within the closer. Closers shall have separate and independent screw valve adjustments for latch speed, general speed, and hydraulic backcheck. Backcheck shall be properly located so as to effectively slow the swing of the door at a minimum of 10 degrees in advance of the dead stop location to protect the door frame and hardware from damage. Pressure relieve valves (PRV) are not acceptable.

1. Acceptable substitutions;

a) None

2.08 TRIM AND PLATES:

A. Kick plates, mop plates, and armor plates, shall be .050 gauge with 32D finish. Kick plates to be 10" high, mop plates to be 4" high. All plates shall be two (2) inches less full width of door.

B. Push plates, pull plates, door pulls, and miscellaneous door trim shall be shown in the hardware schedule.

2.09 DOOR STOPS

A. Door stops shall be furnished for all doors to prevent damage to doors or hardware from striking adjacent walls or fixtures. Wall bumpers equal to Ives WS407 Series are preferred, but where not practical furnish floor stops equal to Ives FS436 or FS438 series. Where conditions prohibit the use of either wall or floor type stops, furnish surface mounted overhead stops equal to Glynn Johnson, 450 series.

2.10 THRESHOLDS AND WEATHERSTRIP:

A. Thresholds and weatherstrip shall be as listed in the hardware schedule.

2.11 DOOR SILENCERS:

A. Furnish rubber door silencers equal to Ives SR64 for all new interior hollow metal frames, (2) per pair and (3) per single door frame.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All hardware shall be applied and installed in accordance with the Finish Hardware schedule. Care shall be exercised not to mar or damage adjacent work.

B. Contractor to provide a secure lock-up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items that are not immediately replaceable, so that the completion of the work will not be delayed by hardware losses both before and after installation.

C. No hardware is to be installed until the hardware manufactures have provided a pre-installation class to insure proper installation of the specified products. A post installation inspection by a manufacturers representative will be provided to insure proper installation.

3.02 ADJUSTING AND CLEANING

A. Contractor shall adjust all hardware in strict compliance with manufacturer's instructions. Prior to turning project to owner, contractor shall clean and make any final adjustments to the finish hardware.

3.03 PROTECTION

A. Contractor shall protect the hardware, as it is stored on construction site in a covered and dry place.

B. Contractor shall protect exposed hardware installed on doors during the construction phase.

3.04 KEY CABINET:

A. Set up and index one (1) Key Cabinet that allows room for expansion for 150% of the number of keys for the project.

3.05 HARDWARE SCHEDULE

A. The following schedule is furnished for whatever assistance it may afford the contractor; do not consider it as entirely inclusive. Should any particular door or item be omitted in any scheduled hardware group, provide door or item with hardware same as required for similar purposes. Quantities listed are for each pair of doors or for each single door.

B. This hardware schedule was prepared by:

Ingersoll Rand Security Technology
735 W. SR 434, Suite H
Longwood, FL 32750
Ph.: (407) 571-2000
Fax: (407) 571-2006

HARDWARE GROUP #1
Provide each PR door(s) with the following:

Quantity	**Description**	**Model Number**	**Finish**
2 ea	Pivot Set	7226	626
2 ea	Pivot	7226 INT	626
1 ea	Power Transfer	EPT10	689
1 ea	Panic Hardware	1690EO	628
1 ea	Panic Hardware	EL1694	628
1 ea	Rim Cylinder	20-057 ICX	626
1 ea	Core Only	23-030	626
2 ea	Surface Closer	1461 Cush SRI	689
2 ea	Mounting Plate	1460-18PA	689
1 set	Weather Strip	By Door Supplier	
1 ea	Threshold	950V	AL
1 ea	Power Supply	PS873 x 871-2	

Quantity	Description	Model Number	Finish
1 ea	Card Reader	By Others	
2 ea	Door Position Switch	7766	628
1 ea		Wiring Diagram	

DOOR FRAME AND HARDWARE TO MEET THE FBC WINDLOAD/IMPACT REQUIREMENTS

HARDWARE GROUP #2
Provide each SGL door(s) with the following:

Quantity	Description	Model Number	Finish
1 ea	Pivot Set	7226	626
1 ea	Pivot	7226 INT	626
1 ea	Panic Hardware	1794	628
1 ea	Rim Cylinder	20-057 ICX	626
1 ea	Core Only	23-030	626
1 ea	Surface Closer	1461 Cush SRI	689
1 ea	Mounting Plate	1460-18PA	689
1 set	Threshold	By Door Supplier	
1 set	Weather Strip	By Door Supplier	

DOOR FRAME AND HARDWARE TO MEET THE FBC WINDLOAD/IMPACT REQUIREMENTS

HARDWARE GROUP #3
Provide each SGL door(s) with the following:

Quantity	Description	Model Number	Finish
2 ea	Hinge	5BB1 4.5 x 4.5 NRP	630
1 ea	Electric Hinge	5BB1 4.5 x 4.5 TW8	630
1 ea	Core Only	23-030	626

Quantity	Description	Model Number	Finish
2 ea	Hinge	5BB1 4.5 x 4.5 NRP	630
1 ea	EU Store Room	L9080TEU-RX L283-059 06A	626
1 ea	Lock Guard	LG12	600
1 ea	Surface Closer	1461 CUSH SRI	689
1 ea	Kick Plate	8400 10" x 2" LDW	630
1 set	Weatherstrip	PS-074 Head and Jambs	BLK
1 ea	Door Sweep	101VA	AL
1 ea	Drip Cap	16A	AL
1 ea	Threshold	950V	AL
1 ea	Power Supply	505-EIR-KLC-CAB-SBP2	
1 ea	Card Reader	By Others	
1 ea	Door Position	7766	628
1 ea		Wiring Diagram	

DOOR FRAME AND HARDWARE TO MEET THE FBC WINDLOAD/IMPACT REQUIREMENTS

HARDWARE GROUP #4
Provide each SGL door(s) with the following:

Quantity	Description	Model Number	Finish
3 ea	Hinge	5BB1 4.5 x 4.5 NRP	620
1 ea	Storeroom Lock	L9080T 06A	626
1 ea	Core Only	23-030	626
1 ea	Lock Guard	LG12	600
1 ea	Surface Closer	1461 Cush SRI	689
1 ea	Kick Plate	8400 10" x 2" LDW	630
1 set	Weatherstrip	PS-074 Head and Jambs	BLK
1 ea	Door Sweep	101VA	AL

Quantity	Description	Model Number	Finish
3 ea	Hinge	5BB1 4.5 x 4.5 NRP	620
1 ea	Drip Cap	16A	AL
1 ea	Threshold	950V	AL

DOOR FRAME AND HARDWARE TO MEET THE FBC WINDLOAD/IMPACT REQUIREMENTS

HARDWARE GROUP #5
Provide each SGL door(s) with the following:

Quantity	Description	Model Number	Finish
3 ea	Hinge	5BB1 4.5 x 4.5 NRP	630
1 ea	Classroom Lock	L9457T 06A	626
1 ea	Core Only	23-030	626
1 ea	Lock Guard	LG12	600
1 ea	Surface Closer	1461 Cush SRI	689
1 ea	Kick Plate	8400 10" x 2" LDW	630
1 set	Weatherstrip	PS-074 Head and Jambs	BLK
1 ea	Door Sweep	101VA	AL
1 ea	Drip Cap	16A	AL
1 ea	Threshold	950V	AL

DOOR FRAME AND HARDWARE TO MEET THE FBC WINDLOAD/IMPACT REQUIREMENTS

HARDWARE GROUP #6
Provide each SGL door(s) with the following:

Quantity	Description	Model Number	Finish
3 ea	Hinge	5BB1 4.5 x 4.5 NRP	630
1 ea	Classroom Lock	L9457T 06A	626
1 ea	Core Only	23-030	626

Quantity	Description	Model Number	Finish
3 ea	Hinge	5BB1 4.5 x 4.5 NRP	630
1 ea	Surface Closer	1461 SRI	689
1 ea	Kick Plate	8400 10" x 2" LDW	630
1 ea	Wall Stop	WS406CVX	630
1 set	Seals	5050B Head and Jambs	BRN
1 ea	Threshold	950V	AL

HARDWARE GROUP #7
Provide each SGL door(s) with the following:

Quantity	Description	Model Number	Finish
3 ea	Hinge	5BB1 4.5 x 4.5 NRP	630
1 ea	Classroom Lock	L9070T 06A	626
1 ea	Core Only	23-030	626
1 ea	Surface Closer	1461 SRI	689
1 ea	Kick Plate	8400 10" x 2" LDW	630
1 ea	Wall Stop	WS406CVX	630
1 set	Seals	5050B Head and Jambs	BRN
1 ea	Threshold	950V	AL

HARDWARE GROUP #8
Provide each SGL door(s)

Quantity	Description	Model Number	Finish
3 ea	Hinge	5BB1 4.5 x 4.5 NRP	630
1 ea	Classroom Lock	L9070T 06A	626
1 ea	Core Only	23-030	626
1 ea	Surface Closer	1461 Cush SRI	689
1 ea	Kick Plate	8400 10" x 2" LDW	630

Quantity	Description	Model Number	Finish
3 ea	Hinge	5BB1 4.5 x 4.5 NRP	630
1 set	Seals	5050B Head and Jambs	BRN
1 ea	Threshold	950V	AL

HARDWARE GROUP #9
Provide each PR door(s) with the following:

Quantity	Description	Model Number	Finish
6 ea	Hinge	5BB1 4.5 x 4.5 NRP	630
2 ea	Manual Flush Bolt	FB458	626
1 ea	Dust Proof Strike	DP1	626
1 ea	Classroom Lock	L9070T 06A	626
1 ea	Core Only	23-030	626
1 ea	Astragal	By Door Supplier	
1 ea	Surface Closer	1461 SRI	689
1 ea	Overhead Stop	450S	630
2 ea	Kick Plate	8400 10" x 1" LDW	630
1 ea	Wall Stop	WS406CVX	630
1 set	Seals	5050B Head and Jambs	BRN
1 ea	Threshold	950V	AL

HARDWARE GROUP NO. 10
Provide each SL door(s) with the following:

Quantity	Description	Model Number	Finish
1 ea		All Hardware by Others	

HARDWARE GROUP NO. 11
Provide each RU door(s) with the following:

Quantity	Description	Model Number	Finish
1 ea	Core Only	23-030	626
1 ea	Mortise Cylinder	26-091 ICX	626
1 ea		Balance of Hardware by Door Supplier	

HARDWARE GROUP NO. 12
Provide each SGL door(s) with the following:

Quantity	Description	Model Number	Finish
2 ea	Hinge	5BB1 4.5 x 4.5	652
1 ea	Electric Hinge	5BB1 4.5 x 4.5 TW8	652
1 ea	Core Only	23-030	626
1 ea	EU Storeroom Lock	L9080TEU-RX L283-059 06A	626
1 ea	Surface Closer	1461	689
1 ea	Kick Plate	8400 10" x 2" LDW	630
1 ea	Wall Stop	WS406CVX	630
3 ea	Silencer	SR64	GRY
1 ea	Power Supply	505-EIR-KLC-CAB-SBP2	
1 ea	Card Reader	By Others	
1 ea	Door Position Switch	7766	628
1 ea		Wiring Diagram	

HARDWARE GROUP NO. 13
Provide each SGL door(s) with the following:

Quantity	Description	Model Number	Finish
3 ea	Hinge	5BB1 4.5 x 4.5	652
1 ea	Privacy Set	ND40S RHO	626
1 ea	Surface Closer	1461	689
1 ea	Kick Plate	8400 10" x 2" LDW	630
1 ea	Wall Stop	WS406CVX	630
3 ea	Silencer	SR64	GRY

HARDWARE GROUP NO. 14
Provide each SGL door(s) with the following:

Quantity	Description	Model Number	Finish
3 ea	Hinge	5BB1 4.5 x 4.5	652
1 ea	Privacy Set	ND40S RHO	626
1 ea	Surface Closer	1461 CUSH	689
1 ea	Kick Plate	8400 10" x 2" LDW	630
3 ea	Silencer	SR64	GRY

HARDWARE GROUP NO. 15
Provide each SGL door(s) with the following:

Quantity	Description	Model Number	Finish
3 ea	Hinge	5BB1 4.5 x 4.5	652
1 ea	Storeroom Lock	ND80TD RHO	626
1 ea	Core Only	23-030	626

1 ea	Surface Closer	1461 Cush	689
1 ea	Kick Plate	8400 10" x 2" LDW	630
3 ea	Silencer	SR64	GRY

HARDWARE GROUP NO. 16
Provide each SGL door(s) with the following:

Quantity	**Description**	**Model Number**	**Finish**
3 ea	Hinge	5BB1 4.5 x 4.5	652
1 ea	Storeroom Lock	ND80TD RHO	626
1 ea	Core Only	23-030	626
1 ea	Surface Closer	1461	689
1 ea	Kick Plate	8400 10" x 2" LDW	630
1 ea	Wall Stop	WS406CVX	630
3 ea	Silencer	SR64	GRY

HARDWARE GROUP NO. 17
Provide each SGL door(s) with the following:

Quantity	**Description**	**Model Number**	**Finish**
3 ea	Hinge	5BB1 4.5 x 4.5	652
1 ea	Classroom Lock	ND70TD RHO	626
1 ea	Core Only	23-030	626
1 ea	Surface Closer	1461	689
1 ea	Kick Plate	8400 10" x 2" LDW	630
1 ea	Wall Stop	WS406CVX	630
3 ea	Silencer	SR64	GRY

HARDWARE GROUP NO. 18
Provide each SGL door(s) with the following:

Quantity	Description	Model Number	Finish
3 ea	Hinge	5BB1 4.5 x 4.5	652
1 ea	Classroom Lock	ND70TD RHO	626
1 ea	Core Only	23-030	626
1 ea	Surface Closer	1461	689
1 ea	Kick Plate	8400 10" x 2" LDW	630
1 ea	Dome Stop	FS438	626
3 ea	Silencer	SR64	GRY

HARDWARE GROUP NO. 19
Provide each SGL door(s) with the following:

Quantity	Description	Model Number	Finish
3 ea	Hinge	5PB1 4.5 x 4.5	652
1 ea	Entrance Lock	ND53TD RHO	626
1 ea	Core Only	23-030	626
1 ea	Wall Stop	WS406CVX	630
1 ea	Silencer	SR64	GRY

HARDWARE GROUP NO. 20
Provide each SGL door(s) with the following:

Quantity	Description	Model Number	Finish
3 ea	Hinge	5PB1 4.5 x 4.5	652
1 ea	Classroom Lock	ND70TD RHO	626
1 ea	Core Only	23-030	626

1 ea	Wall Stop	WS406CVX	630
3 ea	Silencer	SR64	GRY

HARDWARE GROUP NO. 21
Provide each SGL door(s) with the following:

Quantity	**Description**	**Model Number**	**Finish**
3 ea	Hinge	5BB1 4.5 x 4.5	652
1 ea	Push Plate	8200 4" x 16"	630
1 ea	Pull Plate	8303-0 4" x 16"	630
1 ea	Surface Closer	1461	689
1 ea	Kick Plate	8400 10" x 2" LDW	630
1 ea	Wall Stop	WS406CVX	630
3 ea	Silencer	SR64	GRY

HARDWARE GROUP NO. 22
Provide each SGL door(s) with the following:

Quantity	**Description**	**Model Number**	**Finish**
3 ea	Hinge	5BB1 4.5 x 4.5	652
1 ea	Privacy Set	ND40S RHO	626
1 ea	Surface Closer	1461	689
1 ea	Kick Plate	8400 10" x 2" LDW	630
1 ea	Wall Stop	WS406CVX	630
1 set	Seals	5050B Head and Jambs	BRN

HARDWARE GROUP NO. 23
Provide each SGL door(s) with the following:

Quantity	Description	Model Number	Finish
3 ea	Hinge	5BB1 4.5 x 4.5	652
1 ea	Privacy Set	ND40S RHO	626
1 ea	Surface Closer	1461	689
1 ea	Kick Plate	8400 10" x 2" LDW	630
1 ea	Dome Stop	FS438	626
1 set	Seals	5050B Head and Jambs	BRN
1 ea	Threshold	950V	AL

END OF SECTION 08710

SECTION 08800 - GLAZING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Glass and glazing for hollow metal work, storefront doors and windows, glazed walls, and doors.

1.02 RELATED SECTIONS

A. Section 07900 - Joint Sealers: Sealant and back-up material.

B. Section 08410 - Aluminum Entrances and Storefronts: Glazed Doors and Storefronts.

C. Section 08460 - automatic Entrance Doors.

D. Section 10800 - Toilet and Bath Accessories: Mirrors.

1.03 REFERENCES

A. ANSI/ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

B. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.

C. ASTM C1036 - Flat Glass.

D. ASTM C1048 - Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.

E. FGMA - Glazing Manual.

F. FGMA - Sealant Manual.

G. SIGMA - Sealed Insulated Glass Manufacturers Association.

1.04 PERFORMANCE REQUIREMENTS

A. Glass and glazing materials of this section shall provide continuity of building enclosure vapor and air barrier:

1. In conjunction with materials described in Section 07900.
2. Maintain continuous air and vapor barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.

B. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass to a design pressure of 40 lb/sq. ft. as measured in accordance with ANSI/ASTM E330.

C. Limit glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.

1.05 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data on Glass Types Specified: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements.

D. Samples: Submit two samples 12 x 12 inch in size, illustrating glass, coloration and design.

E. Samples: Submit 6 inch long bead of glazing sealant, color as selected by Architect.

F. Manufacturer's Installation Instructions: Indicate special precautions required.

G. Manufacturer's Certificate: Certify that all glass products meets or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with FGMA Glazing Manual, FGMA Sealant Manual, for glazing installation methods.

1.07 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.08 COORDINATION

A. Coordinate the Work with glazing frames, wall openings, and perimeter air and vapor seal to adjacent Work.

1.09 WARRANTY

A. Provide ten year manufacturer's warranty under provisions of Section 01700.

PART 2 -PRODUCTS

2.01 MANUFACTURERS - GLASS MATERIALS

A. Ford Glass Co.
B. Guardian Industries Corp.
C. LOF Glass, Inc.
D. PPG Industries
E. AFG Industries, Inc.
F. Saint-Gobain/Evroglass
G. Substitutions: Under provisions of Section 00100.

2.02 GLASS MATERIALS, GENERAL

A. Float Glass: ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select; 1/4 inch thick minimum, unless otherwise indicated or required by "Performance Requirements".

B. Safety Glass: Clear; fully tempered with horizontal tempering; conforming to ANSI Z97.1; 1/4 inch thick minimum, unless otherwise indicated or required by "Performance Requirements".

C. Wire Glass: Clear, polished both sides square mesh of woven stainless steel wire of 1/2 inch grid size; 1/4 inch thick.

D. Tinted Float Glass: Float type, annealed, tinted heat absorbing and light reducing; quality q3 - (glazing select) color to be selected by Architect.

E. Tinted Heat-Tested Float Glass: Same as "D" except fully tempered; color to be selected by Architect. This shall be installed in all exterior glazed doors and any exterior glazed openings within 12 inches of any door and whose bottom edge is less than 60 inches above finished floor or walking surface.

F. Mirror Glass: (Large framed mirrors and mirrors with S/S edge protectors) flat, Class 1 clear, Quality q2 mirror; 1/4 inch thick, sizes noted on drawings.

G. Laminated impact resistance glass: 9/16" thick impact resistance laminated glass using SaFlex high performance interlayer designed for wind load of 70 psf minimum and penetration resistance of 9lb, 2 x 4 timber at 34 mph.

Impact resistance laminated glass shall be tinted with maximum U value of 0.75 energy efficiency.

Impact resistance laminated glass shall be installed at all exterior windows, storefront doors and side lites.

2.03 MANUFACTURERS - GLAZING COMPOUNDS

A. Acrylic Sealant (Interior Glazing):

1. Pecora "60 + Unicrylic".
2. Protective Treatment Inc., "PTI 738".
3. Tremco, Inc. "Mono".

B. Silicone Sealant (Exterior Glazing):

1. Bostik "Chem-Calk 1200".
2. Dow "Dow Corning 999A".
3. Dow "Dow 795".
4. General Electric "Construction 1200".
5. Pecora Corp. "863".
6. Tremco, Inc. "Proglaze".

2.04 GLAZING COMPOUNDS

A. Acrylic Sealant (Interior Use): Single component, solvent curing, cured Shore A hardness of 15-25; non-bleeding; color as selected.

B. Silicone Sealant (Type GC-F): Single component, chemical curing; capable of water immersion without loss of properties; non-bleeding non-staining; cured Shore A hardness of 15-25; color as selected.

2.05 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene 80-90 Shore A durometer hardness, length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50-60 Shore A durometer hardness, minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10-15 Shore A durometer hardness; coiled on release paper; black color.

D. Mirror Attachment Accessories: Mirror adhesive, chemically compatible with mirror coating and wall substrate.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant.

3.03 EXTERIOR - WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

A. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with butyl sealant.

B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.

C. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.

E. Install removable stops, with spacer strips inserted between glazing and applied stops, 1/4 inch below sight line. Place glazing tape on glazing pane or unit with tape 1/4 inch below sight line.

F. Fill gap between glazing and stop with silicone type sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.

G. Apply cap bead of silicone type sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.04 INTERIOR - WET/DRY METHOD (TAPE AND SEALANT)

A. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sight line.

B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.

D. Install removable stops, with spacer shims inserted between glazing and applied stops at 24 inch intervals, 1/4 inch below sight line.

E. Fill gaps between pane and applied stop with acrylic type sealant to depth equal to bite on glazing, to uniform and level line.

F. Trim protruding tape edge.

3.05 INSTALLATION - MIRRORS

A. Set mirrors with adhesive, applied in accordance with adhesive manufacturer's instructions.

1. Install isolation strip to prevent damage to mirror edges or coating.

B. Place plumb and level.

3.06 CLEANING

A. Clean work under provisions of 01700.

B. Remove glazing materials from finish surfaces.

C. Remove labels after Work is complete.

D. Clean glass and mirrors. Comply with glass product manufacturer's recommendations for final cleaning.

3.07 PROTECTION OF FINISHED WORK

A. Protect finished Work until Final Completion.

B. After installation, mark pane with an "X" by using non-marking, removable plastic tape or paste.

END OF SECTION 08800

SECTION 09220 - PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Two or three coat cement plaster with wood troweled finish coat.

1.02 RELATED WORK

A. Section 09205: Metal furring and lathing.

1.03 REFERENCE STANDARDS

A. ASTM C150 - "Portland Cement".

B. ASTM C6 - "Normal Finishing Hydrated Lime".

C. ANSI A42.2

PART 2 - PRODUCTS

2.01 BASECOAT MATERIALS

A. Cement: Normal - Type I Portland type, conforming to requirements of ASTM C150; grey color.

B. Hydrated Lime: Normal finishing type conforming to requirement of ASTM C6.

C. Aggregate: Natural sand, conforming to ASTM C35; graded within the following limits:

Sieve Size	Percent Passing
No. 4	0
No. 8	0 to 16
No. 16	10 to 40
No. 30	30 to 65
No. 50	95 to 100

D. Water: Clean, potable fresh and free from injurious amounts of oil, acid, alkali, organic matter or other deleterious substances.

E. Bonding Agent: Type recommended for satisfactorily bonding cement plaster to concrete and concrete block surfaces.

2.02 FINISHING PLASTER MATERIALS.

A. Cement: As specified in 2.2.

B. Hydrated Lime: As specified in 2.2.

C. Aggregate: As specified in 2.2 except 100% shall pass No. 8 sieve.

D. Water: As specified in 2.2 D.

2.03 METAL ACCESSORIES

A. Corner Beads, Casing Beads and Base Screeds: Minimum 26 gauge steel with galvanized coating of longest possible lengths; size profiled to suit application. Material shall be zinc where noted on drawings.

B. Expansion Joints: Per detail on drawing.

C. Anchorages: Nails, staples, or other metal supports, of type and size to suit application and to rigidly secure metal accessories in place.

2.04 CEMENT PLASTER MIXES

A. Mix and proportion cement plaster as follows:

1. Basecoat: 1 part cement, minimum 3-1/2 and maximum 4 parts aggregate and minimum 15% and maximum 25% hydrated lime.

2. Finish coat: In accordance with manufacturer's recommendations.

B. Mix only as much plaster as can be used in one hour.

C. Mix materials dry, to uniform color an consistency, before adding water.

D. Protect mixes from frost, dust and evaporation.

E. Do not retemper mixed after initial set has occurred.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prior to application ensure mechanical and electrical services behind surfaces to receive cement plaster have been tested and approved.

B. Clean concrete and concrete block surfaces of dust, latence, efflorescence, loose particles, grease or other foreign matter. Thoroughly wet surfaces before using acid solutions, solvents or detergents to perform cleaning. Thoroughly wash surfaces with clean water immediately following their use. Ensure mortar joints are flush.

C. Roughen smooth concrete surfaces so as to allow adequate adhesion. Use method acceptable to Architect/Engineer.

D. Apply a bonding agent on concrete and concrete block surfaces which are to receive cement plaster. Apply in accordance with manufacturer's recommendations, ensuring complete coverage.

E. Ensure metal lath has been properly installed and rigidly secured.

F. Wet concrete and concrete block surfaces to reduce excessive suction.

G. Place metal accessories true to lines and levels.

3.02 PLASTERING

A. Apply cement plaster using two coat system on concrete block and concrete and d three coat system on metal lath.

B. On concrete block and concrete, apply basecoat to minimum thickness of 3/8 inch. Moist cure and allow coat to slowly dry for a minimum period of 48 hours.

C. On metal lath, apply 3/8" basecoat as above and then apply 1/4" brown coat. Moist cure and allow coat to slowly dry for minimum period of 48 hours.

D. Allow basecoat(s) to cure for a minimum 7 days prior to application of finish coat.

E. Evenly dampen basecoat, to ensure uniform suction, and apply finish coat. Apply to thickness sufficient to secure required texture, but in no case less than 1/4 inch. Apply coat in accordance with manufacturer's recommendations.

F. Maintain surface flatness, with maximum variation of 1/8 inch in 10 feet.

G. Construct control joints at maximum 12 foot centers to Architect/Engineer approval to divide areas into panels not exceeding 125 S.F. in area.

H. Provide surfaces with a wood trowel finish.

I. Avoid excessive working of surface. Delay troweling as long as possible to avoid drawing excess fines to surface.

J. Moist cure finish coat for minimum period of 48 hours.

END OF SECTION 09220

SECTION 09222 - CEMENT PLASTER ON METAL LATH AND MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The Bidding Requirements and Contractual Requirements of Division One shall apply to all work hereunder.

B. Examine other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

D. See Section 07175 "Water Repellent Coating".

1.02 SCOPE

A. Provide cement, stucco and metal lath, and related work as required to complete work indicated on Drawings and specified herein.

1.03 QUALITY ASSURANCE

A. Materials and installation shall comply with material manufacturers' requirements, this Specification, and following:

1. ANSI, A42.2 Portland Cement and Portland Cement-lime plastering, exterior (plaster) and interior.

2. ANSI, A42.3 Lathing and Furring for Portland Cement and Portland Cement-lime plastering, exterior (stucco) and interior.

B. Fire-resistant Ratings: Comply with fire-resistance ratings as indicated on Drawings and as required by governing authorities and codes. Provide materials, accessories and application procedures which have been listed by UL or tested in accordance with ASTM E119 for type of construction shown.

C. Tolerances: Stucco face shall not exceed 3/16" in 8'-0" or 8'-1/8" in 6'-0" plumb from

plumb, flat and level, measured in any direction.

D. Metal separation: Comply with requirements of specification section herein regarding procedures and practices for separation of dissimilar materials.

E. Refer to the latest edition of the Gypsum Construction Handbook by U.S. Gypsum for Quality Standards and Construction Techniques.

1.05 SUBMITTALS

A. Submit for Project Architect's approval two (2) actual stucco samples of each specified finish treatment. Samples shall be minimum 16" square. Rework and resubmit samples as required for approval.

B. Anticipate making numerous samples in order to secure Project Architect's approval.

C. Do all work in precise duplication of approved samples. Remove and redo all rejected work. The Project Architect shall be the sole judge of acceptability of the finish in-place work.

PART 2 - PRODUCTS

2.01 PRODUCTS AND MATERIALS

A. Plaster on metal lath.

B. Lathing Materials:

1. Hangers: 8 gauge galvanized annealed wire or 3/16" or 1/4" round steel rods, painted at interior; galvanized at fascias, soffits, and other exterior locations.
2. Runner channels: 1-1/2" cold rolled steel, 500#/1000 L.F., 16 gauge, paint finish for interior soffits; galvanized at fascias and other exterior locations.
3. Cross channels: 3/4" cold-rolled steel, 300#/1000 L.F., 16 gauge, painted finish at interior; galvanized at soffits, and fascias, and other exterior locations.
4. Tie wire: 16 gauge galvanized annealed wire.
5. Accessories shall typically be galvanized steel for interior use but shall be pure zinc for use at exterior and for use in all horizontal, vertical and corner conditions. projection of accessories shall be to the ground thickness specified for thickness of stucco base.

a. Casing bead: Square of 24 gauge, expanded metal flange or short flange as required, with mitered joints, in single lengths when possible. Following products approved:

National Gypsum	"J" Trim Casing
Milcor	No. 66
USG	No. 66

b. Corner bead: Expanded veneer corner with integral nose of 26 gauge, with 2-1/2" minimum expanded metal or perforated flanges. Following products approved:

National Gypsum	"Expanded Veneer Corner" or "Kal-Corner"
Milcor	No. 1
USG	No. 1A

C. Metal lath (except as otherwise shown on Drawings): 1/8" flat rib lath, 3.4 lb./sq. yd. Use galvanized lath at exterior and use painted lath at interior.

D. Interior corner shall be of 2.5 lb./sq. yd. expanded metal lath "cornerlite" shaped to fit 90 deg. internal corner, with 3" flanges.

E. Hold downs: 1-1/2" channels.

F. Wall furring channels shall be cold roll formed of 25 gauge hot dipped galvanized steel with minimum face width of 1-3/8" and depth of 3/4" or 7/8" as required.

1. Stucco Moldings: provide and install continuous depths to accommodate flush condition with finish. PVC stucco moldings as listed below and as indicated on the Drawings. Conforming with ASTM D1784 PVC for outdoor exposure.

a. Stucco screeds, 1/4" and 3/4" wide, two piece control screeds 'J' molding and 'F' molding. Screed to be horizontal in application.
b. Plaster channel screed 1/4" wide for vertical control joints, soffits and soffit control joints.
c. Aluminum column collar for all column ceiling conditions, interior

and exterior.

d. Vented soffit screed 3" wide and all other vented soffit screed as specified or indicated on drawings.

G. Fiber reinforcement: 1/2" synthetic fibers of size denier polypropylene monofilament, designed specifically for use in stucco and mortar mixes. Such shall be alkali resistant, non-absorptive and completely non-corrosive.

Grace Stucco Fibers

H. Mixing:

1. Water shall contain, by volume; 1 part Acryl 60 Admixture to 3 parts water.
2. Accurately measure ingredients, including water, fiber reinforcement, and Acryl Admixture, using measuring devices of known volume. Proportion successive batches alike.
3. Mix 1 lb. of fiber reinforcement per 1,000 lbs. of dry stucco.
4. Mix materials for minimum of two (2) minutes or until all ingredients present uniform color in mixer. Use minimum amount of water required to produce plaster of workable consistency.

a. Use mechanical mixing equipment, except small applications requiring less than one (1) bag of plastering materials may be hand mixed.

I. Preparation for Plastering:

1. Clean base substrate to receive plaster. Remove substances and obstructions which might impair work. Installation of plaster shall then become responsible to correct imperfections in plaster due to improper preparation of base.

a. Acid etch concrete or masonry bases where necessary to obtain bond of plaster. Clean substrate with solution of muriatic acid and water; flush clean with water.

2. Provide temporary screeds as necessary (to supplement permanent grounds) to ensure uniform thickness of plaster and flat surfaces and to insure accurate contours and profiles.
3. Dampen bases, if required, for proper suction. Do not saturate bases and do not apply plaster until visible surface water disappears.

4. Protect plaster from freezing and from too rapid drying.
5. Before plastering is begun, see that other finish materials are well protected with Kraft paper and that joints are lapped and sealed with tape.

J. Coats and Thickness:

1. Thickness shall be measured as follows:

   a. Measure thickness of plaster from back plane of metal reinforcement is applied over solid base, measure from face of base (substrate).
   b. Plaster thickness on concrete block or on concrete shall be measured from front face of substrate to which applied.
   c. Finish coat thickness specified below shall be minimum, and does not include texturing.

2. Number of coats and thickness of each shall be as follows:

   a. Plaster on metal lath: 3/4" total thickness.

      (1) 5/16" First Base Coat (Scratch Coat)
      (2) 5/26" Second Base Coat (Brown Coat)
      (3) 1/8" Finish Coat

   b. Plaster on concrete block and concrete surfaces: Minimum 3/4" total thickness.

      (1) 3/8" Scratch Coat
      (2) 3/8" Base Coat
      (3) 1/8" Finish Coat

K. Finish Coat Texture:

1. Uniform Sand Float Finish:

   a. As indicted on contract Drawings.

2. Control and Expansion Joints:

   a. Provide joints as indicated on Drawings.

3. Corner Beads:

a. Provide vertical inside corner expansion joints in all metal lath installations.

L. General:

1. Where plaster abuts unplastered construction, a separation shall be provided, such as a casing bead or expansion joint.

M. Lathing Application:

1. Metal Lath: Apply with long dimensions of sheet across supports. Tie to supports with 18 gauge tie wire at intervals not exceeding 6 in. where side of sheets lap at and between supports, tie at 6 in. intervals; lap 1 in. minimum at ends and 1/2 in. minimum at sides. Securely attach lath to abutting surfaces and embed in plaster where adjoining surface is not to be plastered. Start lath one support away from corner and bend into corner at adjoining surface extending 6 in. onto lath when such abutting surfaces are to be plastered, stagger end joints. Supports shall not exceed 16 in. o.c.

a. Casing beads: Set vertical casing beads plumb and set horizontal beads level. From true arises and neat miters. Install beads at all heads and jambs of other openings without frames which occur in plastered walls. Casing beads shall be in single lengths where length does not exceed standard stock lengths.
b. Provide casing beads along edges of openings and where plaster abuts another material, and elsewhere as indicated on Drawings.

2. Apply corner beads to external corners except for coarse finish. Apply casing beads where stucco or plaster terminates in exposed position against, or, in front of, other materials and as indicated on Drawings. When stucco or plaster edges terminate in concealed fashion or dissimilar material join in locations concealed or covered with other trim, casing beads is not required.

3. Control and Expansion Joints:

a. Provide joints as indicated on Drawings.

4. Corner Beads:

a. Provide corner beads at outside corners of all metal lath installations. Use corner beads at masonry corners, except for coarse finish stucco.
b. Provide vertical inside corner expansion joints in all metal lath installation.
c. Set vertical corner beads plumb and horizontal beads level and from true arises and neat miters. Install corner beads at all external corners to be plastered and at heads and jambs of other openings without frames occurring in plastered walls. Corner beads shall be in single lengths where length of corner of jamb does not exceed standard stock lengths.

N. Curing:

1. The plastering sub-contractor shall be responsible for determining proper curing method, rate, duration, dampening of base coats, and time lapse between application of coats based on manufacturer's recommendation, as well as climatic and job conditions.

O. Patching:

1. Patch all cracks.
2. Cut, patch, repair, and point-up plaster as required and as necessary to accommodate other work. Repair cracks and indented surfaces by moistening plaster and filling with new plaster, troweled or tamped flush with adjoining surfaces matching the texture. Point-up finish plaster surfaces around items which are built into or which penetrate plaster surfaces.
3. Cracks and other surface imperfections shall be patched utilizing proprietary patching compound or bonding agent recommended by cement manufacturers.

P. Cleaning and Protection:

1. Provide temporary covering and whatever other provisions are needed to minimize scattering of plaster onto other work. Promptly remove plaster from door frames, windows and other surfaces which are not to be plastered. Repair or replace items where surfaces have been stained, marred or otherwise damaged by plaster work. When plaster work is completed, remove unused materials, containers, equipment and debris.
2. Installer shall advise Contractor of requirements for protection of plaster from deterioration and damage during remainder of construction period.

END OF SECTION 09222

SECTION 09260 - GYPSUM BOARD SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Interior metal stud wall framing.

B. Metal channel ceiling framing.

C. Gypsum board.

D. Gypsum sheathing.

E. Taped and sanded joint treatment.

1.02 RELATED SECTIONS

A. Section 07200 - Insulation: Thermal insulation.

B. Section 09900 - Painting: Surface finish.

1.03 REFERENCES

A. ASTM C36 - Gypsum Wallboard.

B. ASTM C79 - Gypsum Sheathing Board.

C. ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.

D. ASTM C645 - Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.

E. ASTM C754 - Installation of Framing Members to Receive Screw Attached Gypsum Wallboard, Backing Board, or Water Resistant Backing Board.

F. ASTM C840 - Application and Finishing of Gypsum Board.

G. ASTM C1002 - Steel Drill Screws for the Application of Gypsum Board.

H. ASTM E119 - Fire Tests of Building Construction and Materials.

I. GA-201 - Gypsum Board for Walls and Ceilings.

J. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.

K. GA-600 - Fire Resistance Design Manual.

L. ASTM C630 - Water Resistant Gypsum Backing Board.

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate special details associated with fireproofing, and fire-rated closures at top of CMU walls to deck above.

C. Product Data: Provide data on metal framing, gypsum board, joint tape and accessories.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C840, GA-201, GA-216 and GA-600, as applicable.

B. Maintain one (1) copy of each document on site.

1.06 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with minimum five (5) years documented experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated assemblies as indicated by UL listings.

PART 2 - PRODUCTS

2.01 MANUFACTURERS - GYPSUM BOARD SYSTEM

A. Products meeting specified requirements manufactured by any of the following:

1. Domtar Gypsum Co.
2. Georgia-Pacific Corporation.
3. Gold Bond Building Products.
4. USG Industries.

2.02 FRAMING MATERIALS

A. Studs and Tracks: ASTM C645; galvanized sheet steel, 22 gauge thick, C shape.

B. Furring, Framing and Accessories: ASTM C645.

C. Fasteners: ASTM C1002.

D. Anchorage to Substrate: Tie wire, nails, screws and other metal supports, of type and size to suit application; to rigidly secure materials in place.

2.03 GYPSUM BOARD MATERIALS

A. Standard Gypsum Board: ASTM C36; 5/8 inch thick, maximum permissible length; ends square cut, tapered edges.

B. Fire Rated Gypsum Board: ASTM C36; fire resistive type, UL rated; 5/8 inch thick, maximum permissible length; ends square cut, tapered edges.

C. Gypsum Sheathing Board: ASTM C79; moisture resistant type; 5/8 inch thick, maximum permissible length; ends square cut, square edges; water repellent paper faces.

D. Moisture Resistant Gypsum Board: ASTM C630; 5/8 inch thick, maximum permissible length; ends square cut, square edges.

2.04 ACCESSORIES

A. Corner Beads: Metal.

B. Edge Trim: GA 201 and GA 216; Type LC, L, LK, U exposed reveal bead.

C. Joint Materials: ASTM C475; reinforcing tape, joint compound, adhesive, and water.

D. Fasteners: ASTM C1002, Type S12.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings.

3.02 METAL STUD INSTALLATION

A. Install studs in accordance with ASTM C754.

B. Metal Stud Spacing: 16" O.C.

3.03 WALL FURRING INSTALLATION

A. Erect furring channels horizontally; space maximum 16 inches on center, not more than 4 inches from floor and ceiling lines. Secure in place on alternate channel flanges at maximum 24 inches on center.

3.04 FURRING FOR FIRE RATINGS

A. Install furring as required for fire resistance ratings indicated.

3.05 CEILING FRAMING INSTALLATION

A. Install in accordance with ASTM C754.

B. Coordinate location of hangers with other work.

C. Install ceiling framing independent of walls, columns, and above ceiling work.

D. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 24 inches past each end of openings.

E. Laterally brace entire suspension system.

3.06 GYPSUM BOARD INSTALLATION

A. Install gypsum board in accordance with manufacturer's instructions.

B. Erect single layer standard gypsum board in most economical direction with ends and edges occurring over firm bearing.

C. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.

D. Erect exterior gypsum sheathing horizontally, with edges butted tight and ends occurring over firm bearing.

E. Use screws when fastening gypsum board to metal furring or framing.

F. Place control joints consistent with lines of building spaces as indicated.

G. Place corner beads at external corners as indicated. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.

H. Install moisture resistant gypsum backing board at all areas scheduled to receive wall tile.

I. Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum soffit board with sealant.

3.07 JOINT TREATMENT

A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

B. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.

3.08 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.09 GYPSUM BOARD FINISH

A. Level 5 finish: All joints and interior angles shall have tape embedded in joint

compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener head and accessories shall be covered with three separate coats of joint compound. A thin skin coat of joint compound or a material manufactured specifically for this purpose shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges.

END OF SECTION 09260

SECTION 09306 - FLOOR TILE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Ceramic and porcelain tile floor and base finish using the thinset and mortar bed application method, as indicated.

B. Threshold at door opening.

1.02 RELATED SECTIONS

A. Section 03300 - Cast-In-Place Concrete.

B. Section 07900 - Joint Sealers: Mildew resistant sealant.

C. Section 09307 - Wall Tile.

D. Division 15 Sections - Plumbing Specialties: Floor drains.

1.03 REFERENCES

A. ANSI A108.1 - Installation of Ceramic Tile with Portland Cement Mortar.

B. ANSI A108.3 - Quarry Tile and Paver Tile Installed with Latex Portland Cement Mortar.

C. ANSI A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.

D. ANSI A108.10 - Installation of Grout in Tilework.

E. ANSI A118.4 - Latex-Portland Cement Mortar.

F. ANSI A118.6 - Ceramic Tile Grouts.

G. ANSI A118.8 - Modified Epoxy Emulsion Mortar/Grout.

H. ANSI A137.1 - Standard Specifications for Ceramic Tile.

I. TCA (Tile Council of America) - Handbook for Ceramic Tile Installation.

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, and setting details.

C. Product Data: Provide instructions for using adhesives and grouts.

D. For verification purposes, submit the following:

1. Samples: Mount tile and apply grout on two suitably sized plywood panels, illustrating pattern, color variations, and grout joint size variations, for each tile type. (Submit full range of colors and sizes.)

E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.05 MAINTENANCE DATA

A. Submit under provisions of Section 01700.

B. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with ANSI A137.1.

B. Conform to TCA Handbook, ANSI A108.1, ANSI A108.3, and ANSI A108.5.

C. Maintain one (1) copy of each document on site.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing the work of this section with minimum three (3) years documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Do not install adhesives in an unventilated environment.

B. Maintain 50 degrees F. during installation of mortar materials.

PART 2 - PRODUCTS

2.01 TILE MANUFACTURERS

A. Dal-Tile.

B. American Olean Tile Co.

C. Mid-State Tile Co.

D. Substitutions: Under provisions of Section 00100.

2.02 CERAMIC TILE MATERIALS

A. Porcelain Ceramic Floor Tile: TCA A137.1, conforming to the following:

1.	Moisture Absorption	0 to 0.5
2.	Size	Architect Will Select Size and Pattern
3.	Shape	Square
4.	Edge	Square
5.	Surface Finish	Unglazed/Slip, Stain and Impact Resistant
6.	Color	As Selected

2.03 BASE MATERIALS

A. Ceramic base: Refer to Section 09307 - Wall Tile.

2.04 MORTAR MATERIALS

A. Manufacturers: Type specified manufactured by one of the following:

1. C-Cure Chemical Co.
2. L & M Chemical.
3. Laticrete International.
4. Mapei Corporation.

B. Mortar Materials: ANSI A118.4 Latex Modified, Portland cement, sand, latex additive, and water.

2.05 GROUT MATERIALS

A. Manufacturers:

1. C-Cure Chemical Co.
2. L & M Manufacturing, Inc.
3. Laticrete International.
4. Bonsal Corporation.

B. Porcelain Ceramic Mosaic Grout: ANSI A118.6, tile grout, color as selected.

2.06 ACCESSORIES

A. Membrane: For use with mortar bed on slab-on-grade, No. 15 asphalt saturated felt.

B. Waterproofing Membrane: For suspended slabs, thin-set and mortar bed applications, latex rubber waterproofing, which shall be Laticrete 301/335 placed in seamless application and include 4" high integral waterproof base.

C. Reinforcing Mesh: 2 x 2 inch size weave of 16/16 wire size; welded fabric, galvanized.

D. Thresholds: Marble type, white color, honed finish, 4 x 1/2 inch size by full width of wall or frame opening, beveled both sides, radiused edges from bevel to vertical face.

2.07 MORTAR MIX AND GROUT MIX

A. Mix and proportion pre-mix setting bed and grout materials in accordance with manufacturer's instructions.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

3.02 PREPARATION

A. Protect surrounding work from damage or disfiguration.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler.

D. Thin-set application: Apply sealer or conditioner to substrate surfaces in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - THINSET METHOD

A. Install porcelain ceramic mosaic tile, thresholds and grout in accordance with manufacturer's instructions and TCA Handbook, Method TCA F113 except where mortar bed method as indicated.

B. Lay tile to pattern indicated. Where not indicated, request tile pattern. Do not interrupt tile pattern through openings.

C. Place thresholds at exposed tile edges.

D. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align floor, base and wall joints.

E. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

F. Sound tile after setting. Replace hollow sounding units.

G. Keep expansion or control joints free of adhesive or grout. Apply sealant to joints.

H. Allow tile to set for a minimum of 48 hours prior to grouting.

I. Grout tile joints.

J. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.04 CLEANING

A. Clean work under provisions of 01700.

B. Clean tile and grout surfaces.

3.05 PROTECTION OF FINISHED WORK

A. Protect finished Work until project is finally completed.

B. Do not permit traffic over finished floor surface for four (4) days after installation.

END OF SECTION 09306

SECTION 09307 - WALL TILE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Porcelain ceramic tile wall, and base finish using the thinset application method.

1.02 RELATED SECTIONS

A. Section 07900 - Joint Sealers: Mildew resistant sealant.

C. Section 09306 - Floor Tile.

1.03 REFERENCES

A. ANSI A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.

B. ANSI A108.10 - Installation of Grout in Tilework.

C. ANSI A118.4 - Latex-Portland Cement Mortar.

D. ANSI A118.6 - Ceramic Tile Grouts.

E. ANSI A118.8 - Modified Epoxy Emulsion Mortar/Grout.

F. ANSI A137.1 - Standard Specifications for Ceramic Tile.

G. TCA (Tile Council of America) - Handbook for Ceramic Tile Installation.

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, and setting details.

C. Product Data: Provide instructions for using adhesives and grouts.

D. For verification purposes, submit the following:

1. Samples: Mount tile and apply grout on two suitably sized plywood panels, illustrating pattern, color variations, and grout joint size variations, for each tile type.

E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.05 MAINTENANCE DATA

A. Submit under provisions of Section 01700.

B. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with ANSI A137.1.

B. Conform to TCA Handbook, ANSI A108.10.

C. Maintain one (1) copy of each document on site.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing the work of this section with minimum three (3) years documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Do not install adhesives in an unventilated environment.

B. Maintain 50 degrees F. during installation of mortar materials.

PART 2 - PRODUCTS

2.01 TILE MANUFACTURERS

A. Dal-Tile.

B. American Olean Tile Co.

C. Mid-State Tile Co.

D. Substitutions: Under provisions of Section 01600.

2.02 CERAMIC TILE MATERIALS

A. Porcelain Ceramic Wall Tile: TCA A137.1, conforming to the following:

1.	Moisture Absorption	0 to 0.5
2.	Size	Architect To Select Size and Pattern
3.	Shape	Square
4.	Edge	All Purpose Edge
5.	Surface Finish	Matte Glazed
6.	Color	As Selected

2.03 BASE MATERIALS

A. Base: Match floor tile for moisture absorption, surface finish, and color:

1.	Length	Tile Length
2.	Height	Mfg. Std.
3.	Top Edge	Square
4.	Internal Corner	Coved
5.	External Corner	Bullnosed

2.04 MORTAR MATERIALS

A. Manufacturers:

1. C-Cure Chemical Co.

2. L & M Chemical.
3. Laticrete International.
4. Mapei Corporation.

B. Mortar Materials: ANSI A118.4 Latex Modified, Portland cement, sand, latex additive, and water.

2.05 GROUT MATERIALS

A. Manufacturers:

1. C-Cure Chemical Co.
2. L & M Manufacturing, Inc.
3. Laticrete International.
4. Bonsal Corporation.

B. Wall Tile Grout - Regular: ANSI A118.6, tile grout, color as selected.

2.06 MORTAR MIX AND GROUT MIX

A. Mix and proportion pre-mix setting bed and grout materials in accordance with manufacturer's instructions.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

3.02 PREPARATION

A. Protect surrounding work from damage or disfiguration.

B. Vacuum clean surfaces and damp clean.

C. Apply sealer or conditioner to substrate surfaces in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - THINSET METHOD

A. Install adhesive tile and grout in accordance with manufacturer's instructions and TCA Handbook Method Number B413.

B. Lay tile to pattern indicated. Where not indicated, request tile pattern. Do not interrupt tile pattern through openings.

C. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align floor, base and wall joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

E. Form internal angles coved and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep expansion or control joints free of adhesive or grout. Apply sealant to joints.

I. Allow tile to set for a minimum of 48 hours prior to grouting.

J. Grout tile joints.

K. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.04 CLEANING

A. Clean work under provisions of 01700.

B. Clean tile and grout surfaces.

END OF SECTION 09307

SECTION 09511 - SUSPENDED ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system and perimeter trim.

B. Acoustical panels.

1.02 RELATED SECTIONS

A. Section 15936 - Air Outlets and Inlets: Air diffusion devices in ceiling system.

B. Section 16721 - Fire Alarm and Smoke Detection Systems: Fire alarm components in ceiling system.

1.03 REFERENCES

A. ASTM A36 "Standard Specification for Structural Steel".

B. ASTM A123 "Standard Specification for Hot-Dip Galvanized Coatings on Iron and Steel Products".

C. ASTM A366 "Standard Specification for Steel, Carbon Cold-Rolled Sheet, Commercial Quality".

D. ASTM A446 "Standard Specification for Steel Sheet, Galvanized by the Hot-Dip Process, Structural Quality".

E. ASTM A525 "Standard Specification for General Requirements for Sheet Steel, Galvanized by the Hot-Dip Process".

F. ASTM A525 "Standard Specification for General Requirements for Steel Sheet, Galvanized Carbon Steel Wire".

G. ASTM C423 "Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method".

H. ASTM C635 "Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings".

I. ASTM C636 "Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels".

J. ASTM E84 "Standard Test Method for Surface Burning Characteristics of Building Materials".

K. ASTM E413 "Standard Classification for Determination of Sound Transmission Class".

L. ASTM E 1264 "Standard Classification for Acoustical Ceiling Products.

M. Ceilings and Interior Systems Contractors Association (CISCA) Handbook.

1.04 SYSTEM DESCRIPTION

A. Suspension system to rigidly secure acoustical ceiling system including integral mechanical and electrical components with maximum deflection of 1/360.

1.05 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other work or ceiling finishes, interrelation of mechanical and electrical items related to system.

C. Product Data: Provide data on metal grid system components, and acoustical units.

D. Samples: Submit two (2) samples full size illustrating material and finish of acoustical units.

E. Samples: Submit two samples each, six (6) inches long, of suspension system main runner, cross runner and edge trim.

F. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and other data required for special conditions.

1.06 QUALIFICATIONS

A. Grid Manufacturer: Company specializing in manufacturing the Products specified

in this section with minimum three (3) years documented experience.

B. Acoustical Unit Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for combustibility requirements for materials.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Maintain uniform temperature of minimum 60 degrees F and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.09 SEQUENCING

A. Sequence Work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead Work is completed, tested, and approved.

B. Install acoustical units after interior wet Work is dry.

1.10 EXTRA MATERIALS

A. Furnish under provisions of Section 01700.

B. Provide 2 percent of total acoustical unit area of extra panels to Owner. All panels shall be full size units, packaged with protective covering or in manufacturer's cartons and identified with label to denote contents.

PART 2 -PRODUCTS

2.01 MANUFACTURERS - SUSPENSION SYSTEM

A. Armstrong Suspension Systems.

B. Chicago Metallic Corporation.

C. Donn Corp.

D. Substitutions: Under provisions of Section 01600.

2.02 SUSPENSION SYSTEM MATERIALS

A. Non-fire Rated grid

1. ASTM C635 Classification:

a) Intermediate duty.
b) Interlocking main runners and cross tees.

2. Grid Components and Sizes: Roll-formed double web steel tee construction pursuant to ASTM C635 for direct hung installation. Continuous exposed bottom flange design with unbroken roll-formed cap running full length of member.

a) Override grid intersection, stab system.

1) 1-1/2 in. high main tee runners.
2) 1-3/8 in. minimum high cross tees; 7340 with minimum carrying capacity of 12 lb/lin. ft.

3. Steel Finish: All steel roll-formed parts chemically cleansed, electrogalvanized or hot-dipped galvanized, and protective conversion coated. All exposed surfaces to receive a baked polyester finish.

4. Hanger Wire: Galvanized carbon steel per ASTM C641, soft temper, prestretched, yield stress load of at least three (3) times design load but not less than 12 gage (0.106 in.) diameter.

5. Grid color:

a) White.

6. Wall molding:

a) Angle, 15/16 inc.

7. Molding color:

a) White.

2.03 MANUFACTURERS - ACOUSTICAL UNITS

A. Armstrong.

B. Celotex.

C. USG.

D. Substitutions: Under provision of Section 01600.

2.04 ACOUSTICAL UNIT MATERIALS

A. APC Type 1 - All areas of the new building

1. Product:

a) Armstrong: Cortega Miatone, No. 703 herein.

2. Basic compliance standard: ASTM C1264.

a) Classification: Type III.
b) Form: 2.
c) Pattern: CD.

3. Panel Size: 24 in. x 48 in. x 5/8 in.
4. Panel edge detail: 5/8 in. angled 2 tegular Minatone.
5. Exposed surface color: White
6. Physical Data:

a) Flamespread: 0-25, ASTM E84. Class A rated, ASTM E1264.
b) NRC Range (ASTM C423): 0.50-0.60.
c) STC Range (ASTM E413): 35-39.
d) Light Reflectance: 0.80, ASTM E1264.

7. Manufacturer: Armstrong World Industries, Inc.
8. Substitutions: Under provisions of Section 01600.

B. APC Type 4 - kitchen, dining and day area tile:

1. Product:

a) Armstrong: Plain Ceramaguard Fire Guard, No. 605A.

2. Classification Marking: UL
3. Basic compliance standard: ASTM E1264.

a) Classification: Type XX.
b) Form: None
c) Pattern: G

4. Panel size: 24 in. x 48 in. x 5/8 in.
5. Panel edge detail: Square-cut lay-in.
6. Exposed surface color: White
7. Exposed surface finish: Acrylic paint.
8. Physical Data:

a) Flamespread: 0-25, ASTM E84. Class A rated, ASTM E1264.
b) NRC Range (ASTM C423): 0.15-0.25.
c) STC Range (ASTM E413): 40-44.
d) Light Reflectance: 0.80, ASTM E1264.

9. Manufacturer: Armstrong World Industries, Inc.
10. Substitutions: Under provisions of Section 01600.

2.05 ACCESSORIES

A. Acoustical Sealant: Heavy-bodied, non-shrinking, non-drying, non-sag for sealing edge molding and other applications indicated or required.

B. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that layout of hangers will not interfere with other Work.

3.02 INSTALLATION - LAY-IN GRID SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636 and as supplemented in this Section.

B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.

C. Locate system on room axis according to reflected plan, except that edge units shall not be less than 50 percent of acoustical unit size.

D. Install after major above-ceiling Work is complete. Coordinate the location of hangers with other Work.

E. Supply hangers or inserts if required for installation to Section 03010 with instructions for their correct placement.

F. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within six (6) inches of each corner; or support components independently.

I. Do not eccentrically load system, or produce rotation of runners.

J. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.

K. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install units after above ceiling Work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp and dents.

F. Cut panels to fit irregular grid and perimeter edge trim.

G. Where bullnose concrete block corners or round obstructions occur, provide preformed closer to match edge molding.

H. Install hold-down clips to retain panels tight to grid system within 20 feet of an exterior door.

3.04 ERECTION TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION 09511

SECTION 09680 - CARPET

PART 1 - GENERAL

1.01 DESCRIPTION

A. Summary

1. Work of this Section includes furnishing and installation of carpeting, adhesives and accessories

B. Definitions

1. Commercial grade, soil protection, Florsept Antimicrobial, Antistatic Carpet Tile.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product literature and installation instructions for carpet tile material and installation accessory required.

1. Submit written data on physical characteristics, durability, resistance to fading and flame resistance characteristics.

B. Submit manufacturer's standard size samples showing full range of colors, textures and patterns available.

C. Submit full size carpet tile sample.

D. Certification: Submit manufacturer's certificate stating that materials furnished comply with specifdied requirements. Include supporting certified laboratory testing data indicating that material meets specified test requirements.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm (material producer) with not less than 10 years of production experience, whose published literature clearly indicates general compliance of products with requirements of this Section.

B. Installer Qualifications: Firm specializing in carpet installation with not less than 5

years of successful experience in installation of carpeting similar to that required for this project.

C. Single Source Responsibility: Provide material produced by a single manufacturer for the carpet tile.

D. Testing:

1. Test Reports: Submit certified test reports evidencing compliance with requirements for the following:

   a. Fire performance characteristics.
   b. Physical properties indicated.

2. Fire Performance Characteristics: Provide carpeting that is identical to that tested for the following fire performance requirements, according to test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

   a. Flammability: As follows:
      Rating: Passing Methenamine Pill Test.
      Test Method: ASTM D2859.

3. Critical Radiant Flux: As follows: Test Method: ASTM E648:

   a. Change to Class I.

4. Smoke Density: As follows:

   a. Rating: With flame, less than 450 in flaming mode.
   b. Test Method: ASTM E662.

1.04 PHYSICAL PROPERTIES

A. Provide carpeting that is identical to that tested for the following physical properties, according to the test method indicated.

B. Fade Resistance: As follows:
Rating: Maximum grey scale factor of 40 hours.
Test Method: AATCC 16E.

C. Static Resistance:
Rating: Less than 3.5 kV when tested at 20% R.H./70°F.
Test Method: AATCC 134.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, quallity or grade, fire hazard classification, and lot number. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity; laid flat, blocked off ground to prevent sagging or warping. Maintain temperature in storage area above 40 degrees Fahrenheit.

1. Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements.

1.06 SEQUENCING AND SCHEDULING

A. Sequence carpet installation with other work to minimize possibility of damage and soiling during remainder of construction period.

1.07 GUARANTEES AND WARRANTIES

A. Upon completion, the carpet contractor must submit a certificate guaranteeing the installation to be free of defects in workmanship for a period of one year to include the statement that: the carpet contractor shall, at his own expense and upon written notice from the Architect, promptly correct/replace any and all improper work and material that may become apparent within twelve months after the date of final completion.

B. Carpet manufacturer must certify by register and roll numbers that carpet shipped for this project complies with all requirements of the specifications subject to normal manufacturing tolerances.

C. Provide ten year warranty signed by the manufacturer, installer, and contractor. The warranty shall include the repair and/or replacement of the carpet which fails in materials or workmanship including, but not limited to, delamination, edge ravel, and color loss.

D. Provide manufacturer's standard ten year wear guarantee which shall include a face fiber loss of less than 10% by weight.

1.08 MAINTENANCE

A. Maintenance Instructions: Submit manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated traffic and

use conditions. Include precautions against materials and methods which may be detrimental to finishes and performance.

PART 2 - PRODUCTS

2.01 MATERIALS

Style Name:	PARALLELS II SQ as Shaw product or equal
Style Number:	59235
Construction:	Pattern Loop
Fiber Brand:	Solution Q Nylon
Dye Method:	100% Solution Dyed
Protective Treatment:	SSP Shaw Soil Protection, Florsept Antimicrobial, Antistatic
Primary Backing:	Polypropylene
Secondary Backing:	Permabac
Gauge:	1/10
Average Yarn Weight:	26 oz/sq yd
Stiches per Inch:	10
Tufted Pile Thickness:	.156 inches
Finished Pile Thickness:	.090 inches
Total Thickness:	.309 inches
Average Density:	10,400 oz/yd3
Weight Density:	270400 sq oz/yd5
Total Weight:	151.5 oz/sq yd
Radiant Panel (ASTM E-648):	Class 1
Flaming Mode:	<450
Static (AATCC-134):	<3.5 Kv
Type Static Control:	Permanent Conductive Fiber
Pattern Repeat:	19/32"W X 1-6/32"L
Size:	Tile 18x18

2.02 ACCESSORIES

A. Carpet Edge Guard, Non-Metallic: Extruded or molded heavy-duty vinyl or rubber carpet edge guard of size and profile indicated; minimum 2 inches wide anchorage flange; colors selected by Project Manager from standard colors.

B. Installation Adhesive: Water-resistant, non-staining as recommended by carpet manufacturer, which complies with flammability requirements for installed carpet.

The adhesive shall contain no measurabel quantities of Styrene Butadiene or Phenylcyclohexene.

C. Miscellaneous Materials: As recommended by manufacturers of carpet tile.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates for moisture content and other conditions under which carpet tile is to be installed. Notify contractor in writing of major conditions detrimental to proper completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Repair minor holes, cracks, depressions, and rough areas using material recommended by carpet or adhesive manufacturer.

B. Clear away debris and scrape up cementitious deposits from surfaces to receive carpeting: vacuum clean immediately before installation. Check concrete surfaces to ensure to dusting through installed carpet; apply sealer where required to prevent dusting.

3.03 INSTALLATION

A. Refer to carpet tile manufacturer's installation instructions.

3.04 CLEANING

A. Remove and dispose of debris and unusable scraps. Vacuum carpet using commercial machine with face-beater element. Replace any damaged carpet tile.

3.05 PROTECTION

A. Provide protective methods and materials needed to ensure that carpeting will be without deterioration or damage at time of substantial completion.

B. Warranty: Lifetime Commercial Standard.

END OF SECTION 09680

SECTION 09699- WATER VAPOR EMISSION CONTROL SYSTEMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, documents, and general provisions of the Contract, including, but not necessarily limited to, General Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Sections- Coordinate work of this Section with work of other Sections to properly execute the work requirements and maintain satisfactory progress of work in other Sections.

1. Section 03300: Cast-In Place
2. Section 01410: Testing Laboratory Services
3. Section 09705: Chemical Resistant Resinous Flooring.

1.02 SUMMARY

A. This Section includes the furnishing, testing, and application of systems for the reduction of moisture vapor transmission and alkalinity control for Interior concrete slabs requiring the installation epoxy flooring systems.

1.03 SUBMITTALS

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

B. Product data for each type of product and process specified, which shall include:

1. Manufacturer's Specification
2. Installation Instructions
3. Independent Test Data
4. Certification Requirements
5. Warranty Information

C. Submit anhydrous calcium chloride testing according to ASTM F 1869-98 that shall be performed by the independent testing laboratory employed by general contractor.

1.04 QUALITY ASSURANCE

A. Qualifications of Applicator

1. Employ an Applicator currently approved by the manufacturer, experienced In surface preparation and application of the material and subject to inspection and control of the manufacturer.
2. Installer shall have no less than five (5) years experience installing the fluid based coating systems.

B. Manufacturer's Qualifications

1. Manufacturer shall have no less than five (5) years experience in manufacturing water vapor reduction systems. The water vapor reduction system must be specifically formulated and marketed for water vapor reduction and alkalinity control without change of formulation or system design for a minimum period of five (5) years.
2. Manufacturer shall provide the Owner with their standard ten (10) year warranty at no additional cost. Applicator of water vapor reduction system shall provide standard installation warranty for workmanship.
3. Manufacturer must provide Independent lab test reports documenting performance per the following:

    a. ASTM E 96, Water Vapor Transmission (dry and wet methods) Performance shall be documented by an independent testing laboratory at a minimum of 90% for Koester VAP I 2000 System, water vapor transmission reduction compared to untreated ACI Committee 201 durable concrete.
    b. ASTM D 1308; Insensitivity to alkaline environment up to pH 14.
    c. Certify acceptance and exposure to continuous topical water exposure after final cure.
4. Submit list of product use and performance history, for the same formulation and system design, listing reference sources. Similar projects shall have documented minimum initial water vapor transmission rates of 15 lbs per 1000 ft² per 24 hours and have resulted in maintained water vapor reduction rate of less than 3 lbs per 1000 ft² per 24 hours when tested to ASTMF 1869.98.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver products to the job site in their original unopened containers, clearly labeled with the manufacturer's name and brand designation.

B. Store products in an approved ventilated dry area; protect from dampness, freezing,

and direct sun light. Product should not be stored in areas with temperatures in excess of 90 ˚F or below 50 ˚F.

C. Handle product in a manner that will prevent breakage of containers and damage products.

1.06 PROJECT/SITE CONDITIONS

A. Environmental Conditions:

1. Do not apply moisture vapor reduction system to unprotected surfaces or when water is accumulated on the surface of the concrete.
2. Do not apply water vapor reduction system when temperature is lower than 50˚ F or expected to fall below this temperature within 24 hours from time of application.
3. Allow continuous ventilation and indirect air movement at all times during application and curing process of the water vapor reduction system.

B. Protection: Protect water vapor reduction system to prevent damage from active rain or topical water for a minimum period of 24 hours from time of application.

1.07 SCHEDULING

A. Before installation of epoxy flooring systems over the interior concrete slabs, anhydrous calcium chloride testing shall be performed as per ASTM F 1869-98 by the testing laboratory as outlined in Article 3.1 below to determine the level of water vapor transmission In the slab and the type of moisture vapor reduction system required.

B. The general contractor shall schedule water vapor reduction system testing and allowing enough time to test, submit and install the water vapor reduction system before installation of floor finish.

C. The testing laboratory will allow for as much time as is reasonable for the concrete slab to dry before installing anhydrous calcium chloride tests. All mastics, glues, and/or contaminants shall be removed to provide a clean, sound, concrete substrate prior to installing anhydrous calcium chloride tests as per ASTM F 1869-98. No Exceptions!

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Water vapor reduction system, which may be Incorporated In the work, shall be the product of a single manufacturer, no substitutions. Manufacturer's offering approved products such as:

1. Koester VAP I 2000 System by Koester American Corporation; Corporate Headquarters:
(757) 425-1206. Western Regional Office: (541) 548-0210.

B. Terminology hereafter is based upon the products of Koester American Corporation.

2.02 MATERIALS

A. General: Use materials of one manufacturer throughout the project as hereinafter specified.

B. Water based primer/curing agent, 100 % solids VAP I 2000 coating, containing specifically formulated chemicals and resins to provide the following characteristics and properties.

1 ASTM E 96, Water Vapor Transmission (dry and wet methods) Performance shall be documented by an independent testing laboratory at a minimum 90% for Koester VAP I 2000 System water vapor transmission reduction compared to untreated concrete ACI Committee 201 durable concrete.
2 ASTM D 1308; Insensitivity to alkaline environment up to pH 14.
3 Certify acceptance and exposure to continuous topical water exposure after final cure.

2.03 KOESTER VAP I 2000 SYSTEM

A. This one (1) coat system consists of one (1) coat of VAP I 2000 applied to a properly prepared concrete surface. Anhydrous calcium chloride testing performed by the testing laboratory having water vapor transmission levels greater then 3 lbs/24hrs per 1000/sf. and less then 25 lbs/24 hrs per 1,000/sf. (depending on Individual conditions) shall determine where this system Is utilized and the coverage rates required. The floor covering system and adhesive having the ability to withstand water vapor transmission levels up to 3 lbs/ 24 hrs per 1000/sf. The water vapor reduction system shall be required to reduce vapor emissions by a minimum of 90% after final cure. Verify water vapor reduction by anhydrous calcium chloride testing according to ASTM F 1869-98 prior to proceeding with any floor covering installation.

2.04 AREA NOT REQUIRING VAPOR REDUCTION SYSTEM

A. Water vapor reduction system might be required on concrete floors with water vapor transmission level less than 3 lbs/24 hrs per 1,000 sf. or 5 lbs for some specific flooring systems verify with flooring system manufacturer.

B. Water vapor reduction system is not required on Interior concrete slabs without floor finishes.

2.05 MIX DESIGNS

A. Use clean containers and mix thoroughly as per Manufacturer's requirements to obtain a homogeneous mixture. Use a low speed motor less than 400 rpm and a two bladed Jiffy mixing blade only. DO NOT AERATE. Mix ratios are measured by volume.

B. VAP I 2000 Mix Ratio: Mix Component A and B at a ratio of 2.4:1 by volume.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Calcium Chloride test requirements:

1. Anhydrous calcium chloride testing shall be performed by the testing laboratory as outlined in Section 01410 - Quality Requirements.

2. Provide anhydrous calcium chloride tests according ASTM F 1869 - 98 In accordance to all surface preparation methods outlined. Tests shall be installed onto freshly abraded contaminant free concrete. No exceptions!

3. Only conduct calcium chloride tests at the same temperature and humidity expected during normal use. If this is not possible, then the test conditions should be 75˚F +-10˚F and 50+-10% relative humidity. Maintain these conditions 48 hours prior to and during tests. Water vapor transmission levels are directly affected by ambient room temperature and readings conducted without a sustained ambient temperature are NOT acceptable.
4. Testing laboratory shall provide test results with a marked up floor finish plan showing test results. Testing laboratory shall provide a written clarification on status of the ambient air temperature and humidity before and during the testing procedures.
5. Testing laboratory shall provide a marked up floor plan showing areas with vapor reduction system recommendations.

B. Initial calcium chloride tests:

1. Before installation of epoxy flooring systems over interior concrete slabs, the testing laboratory shall make known the level of water vapor transmission in the slab in accordance to ASTM F 1869-98 to all parties involved. The testing laboratory will document the test results and provide recommendations on the type of moisture vapor reduction system to be utilized.

C. Floor treatment calcium chloride tests:

1. After proper cure of the final coat of the water vapor reduction system the testing laboratory shall provide calcium chloride tests to determine if the level of water vapor transmission and alkalinity are reduced to the specified levels by the flooring manufacturer's installation requirements. Contact Architect and water vapor reduction system Manufacturer's Representative concerning areas with a water vapor transmission level greater than the flooring manufacturer's specified levels.

3.02 PREPARATION

A. Inspect all surfaces with regard to their suitability to receive moisture vapor reduction system by vapor reduction coating system.

B. Clean all surfaces to receive moisture vapor reduction system. Shot blast all floors and clean surfaces with Shop Vac to remove all residue off the substrate. Remove ALL defective materials, and foreign matter such as dust, adhesives, leveling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance, Shotblast bee bees, etc. Repair all cracks, expansion joint, control Joints, and open surface honeycombs and fill in accordance with Manufacturers recommendations. Inform vapor reduction system manufacturer if concrete additives like chlorides or any other soluble compounds that can contaminate surfaces have been used in the concrete mix. Reinforcing fibers must be burned off, scraped and vacuumed, after Shotblasting, leaving no fibers left on the concrete surfaces. Provide uncontaminated, absorptive sound surface. DO NOT ACID ETCH!

C. Repair concrete prior to moisture vapor reduction system installation by utilizing Koester SB Bonding Emulsion with approved concrete repair materials. Comply with all requirements as listed in Manufacturer's technical data information. No exceptions. Consult with vapor reduction manufacturer.

D. Make sure that surfaces to be treated with moisture vapor reduction system have NOT previously been treated with other materials like underlayments, screeds,

penetrating sealants, etc. If this is the case, consult with the Manufacturers Representative prior to any application of moisture vapor reduction system.

E. Any testing for concrete deficiencies / contamination like alkaline silica reaction, untreated silicates, organic residue, etc. is the responsibility of the Building owner.

F. Only a surface substrate that REMAINS uncontaminated, absorptive, and sound is fit to receive a water vapor reduction system. Comply with all requirements as listed in Manufacturer's technical data information. No exceptions.

G. Proper removal of contaminants can render surfaces too rough for certain flooring systems. Therefore Shotblast a small test area and verify with the flooring applicator that the surfaces are fit to receive the specified flooring system without the application of an underlayment on top of the VAP I 2000 System.

3.03 APPLICATION

A. VAP I 2000 System Application:

1. The coverage rates for this Single Coat system depend on the surface texture and porosity of the substrate as well as the measured level of moisture, from Section 3.1 Examination. On average, coverage of 90-130 sq.ft./gal. can be expected.
2. Approximate Coverage Relative to Existing Levels of Moisture Vapor
   Up to 8 lbs/1000 sq.ft/24hr. 130 sq.ft./gallon
   Up to 15 lbs/1000 sq.ft.24hr. 90 sq.ft./gallon
   Up to 25 lbs/1000 sq.ft/24 hr. 70 sq.ft./gallon
3. Apply one coat of VAP I 2000 at an average coverage rate of 90-130 sq. ft. /gallon using a squeegee and or 3/8 inch nap roller leaving no areas untreated. Allow to cure a minimum of 12 hours before installing flooring system. (See additional application instructions in Koester technical data sheets.)

3.04 CLEANING

A. Clean all tools and equipment with xylene immediately after use when using the VAP I 2000 System.

3.0.5 PROTECTION

A. Protect each coat during specified cure period from any kind of traffic, topical water and contaminants.

END SECTION 09699

SECTION 09705 - CHEMICAL RESISTANT RESINOUS FLOORING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Provide labor and materials for a seamless, heavy duty, abrasion and chemical resistant, epoxy/urethane flooring system, including surface preparation, primers, and finish coats on apparatus bay floor surfaces and Decon Room floor and wall surfaces.

1.02 RELATED SECTIONS

A. Concrete - Division 3

B. Thermal & Moisture Protection - Division 7

1.03 ACCEPTABLE MANUFACTURERS AND INSTALLERS

A. DUR-A-FLEX INC 1-800-253-3539

B. Manufacturer approved Installer, who has technical qualifications, currently approved in writing, and facilities to install specified systems.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver material to job site in clean, clearly labeled containers and inspect prior to start of job.

B. Store material in a dry, enclosed area protected from the elements. Keep temperature of storage area between 60° and 90° F.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Cure new concrete no less than 28 days under good conditions.

B. Verify that substrate is properly equipped with vapor barriers and perimeter drains.

C. Verify supply of adequate utilities, including electric, water, heat (between 60° and 90° F.) and lighting of no less than 80 ft candles measured at floor surface.

D. Free work area of other trades during, and for a period of 24 hours, after floor installation.

E. Provide owner a water vapor transmission test in accordance with ASTM E96-95, test result and recommendation. Regarding the installation of VAP1 2000 from Koester American Corporation Products in water vapor transmission control is needed.

F. Protect finished floor from damage by subsequent trades.

1.06 WARRANTY

A. Submit a five year warranty against defects in material and workmanship upon substantial completion of installation from the manufacturer.

B. Letter of Certification of Acceptance from Manufacturer's Representative stating that the installation is monitored by Manufacturer's Representative and find it meeting the Manufacturer's requirements and standards.

C. Letter from installer to warranty the product and installation.

D. Letter from General Contractor to warranty the product and installation.

PART 2 - PRODUCTS

2.01 PRODUCT DESCRIPTION

A. 1/8" **SHOP FLOOR** with **POLY-THANE #3** Multiple Component, Seamless, Heavy Duty, Chemical Resistant, Epoxy/Urathane Floor System as manufactured by DUR-A-FLEX INC. **1-800-253-3539**.

2.02 PHYSICAL PROPERTIES

Physical Property	Test Method	Result
Hardness (Shore D)	ASTM D-2240	75-80
Compressive Strength	ASTM D-695	17,500 psi
Tensile Strength	ASTM D-638 ASTM C-307	4,000 psi 2,600 psi
Tensile Elongation	ASTM D-638	7.50%

Flexural Strength	ASTM D-790 ASTM C-580	6,250 psi 4,500 psi
Flexural Modulus of Elasticity	ASTM D-790	6.2×10^5
Linear Shrinkage	ASTM D-2566	0.02%
Coefficient of Linear Expansion	ASTM D-696	2×10^{-5}
Bond Strength to Concrete	ASTM D-4541	400 psi substrate fails
Indentation	ML D-3134	.025 MAX
Impact Resistance	ML D-3134	Pass
Water Absorption	ASTM D-570	0.04%
Heat Resistance Limitation		140°F - 200°F
Flammability	ASTM D-570	Self Extinguishing
Flame Spread/NFPA 101	ASTM E-84	Class B
Abrasion Resistance CS17 Wheel 1000 GM Load 1000 Cycles	STM C-501	 15 mg loss
Coefficient of Friction Standard Slip-Resistant Orange Peel	ASTM D-2047	 0.9 0.8

2.03 PRODUCT MIXING

A. Mix on site with manufacturer supplied mix and measure apparatus to ensure a timely, accurate mix ratio and minimize waste.

PART 3 - EXECUTION

3.01 PREPARATION

A. Create a surface profile with a steel shot blast machine and dust-free diamond grinders for edges.

B. Verify that surface is dry and perfectly clean, free of all oil, grease, detergent film, etc.

3.02 INSTALLATION

A. Adhere strictly to manufacturer's current written instructions.

B. Apply prime coat of **DUR-A-SHIELD #2** or **DUR-A-POXY HIGH GLOSS** and allow to cure.

C. Apply 1/8" **SHOP FLOOR** System.

D. Broadcast non skid aggregate to excess, and allow to cure.

E. Sweep up excess aggregate.

F. Apply 15 mil topcoat of pigmented **DUR-A-GLAZE SHOP FLOOR** and allow to cure.

G. Apply 3 mil performance topcoat of **POLY-THANE #3** with a quality non-shed roller, and allow to cure.

3.04 DETAILS

A. A thoroughly route and vacuum moving cracks and joints, then fill with ELAST-O-COAT or DUR-A-FILLER #2.

B. Pre-patch non-moving surface deviations with patching compound comprised of 100% solids epoxy and aggregate.

C. "Key in" all drains, edges and transition points according to manufacturers instructions.

D. Install a 4" integral cove base at perimeter walls.

END OF SECTION 09705

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SCOPE OF WORK

A. Work in general includes surface preparation, surface repairs, caulking, sealant, patching and application of the paint coating to the substrates and systems outlined in this specification. It is the intent of the specifications that all surfaces (except those specifically noted otherwise) be painted or finished for a thoroughly complete job in every respect whether every item is herein specified or not.

B. Paint exposed surfaces whether or not colors are designated in "schedules", except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available. All exposed electrical conduit, except in electrical rooms, mechanical rooms, janitor rooms, etc., shall be painted.

1.03 WORKMANSHIP AND APPLICATION CONDITIONS

A. Paint only in dry weather when temperature is 50^{o} F or higher. Stop exterior work early enough to permit paint film to set up before condensation occurs (caused by night temperature drops). Do not begin painting until surfaces are moisture free.

B. Keep paint at room temperature.

C. Keep dust, dirt and debris away from work before and during painting.

D. Execute work in accordance with label directions. Coating application shall be made in strict conformance to this specification and to the manufacturer's instructions on the product labels and product data sheets.

E. Paint only dry wood (less than 15% moisture). Defer painting after rain or washing,

until surface is dry.

F. All work shall be accomplished by skilled workmen familiar with and trained to do this type of work and they shall be further qualified to operate or use the equipment or rigging needed to accomplish this work.

G. All materials shall be applied evenly, free of runs, sags, and pinholes.

H. Only the manufacturer's thinners/reducers may be used to thin the respective products and only in the amounts prescribed.

I. All shrubbery, landscaping, carpeting and sprinkler systems shall be fully protected against damage during each stage of the painting project.

J. All exterior substrates not designated to receive paint coatings shall be kept free of paint residue and over spray, e.g., windows, walkways, driveways, floors, etc.

K. Normal safety signs, necessary lighting and temporary fencing around work areas shall be installed and maintained and work performed in accordance with OSHA requirements while the job is in progress.

L. A progress schedule shall be furnished by the contractor to the Owner or the Owner's agent for approval and shall be based on the contract completion date. Contractor shall advise the Owner or Owner's agent of those areas in which work is to be performed sufficiently in advance of the work schedule to permit the Owner to prepare for the work, advise employees, move vehicles, etc.

1.04 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

B. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect of any problems anticipated using the materials specified.

1.05 JOB CONDITIONS

A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label.

B. Apply water based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg. F (10 deg. C) and 90 deg. F (32 deg. C).

C. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg. F (7 deg. C) and 95 deg. F (35 deg. C).

1.06 SUBMITTALS

A. Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use and all material safety data sheets for approval before starting work.

B. Samples: Prior to beginning work, Architect will furnish three (3) or more color chips for surfaces to be painted. Use representative colors when preparing samples for review. Submit samples for Architect's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.

C. On actual wall surfaces, door faces and other interior and exterior building components, duplicate painted finishes of prepared samples. provide full coat finish samples on at least 100 S.F. of surface, as directed, until required sheen, color and texture is obtained; simulate finished lighting conditions for review of in-place work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All materials used in this paint contract/project shall be as manufactured or distributed by the paint company of choice that meet specification and delivered on the job in original, sealed containers.

B. The paints / materials herein specified will be enforced as the required projects.

C. All materials shall be used according to label directions and applied at package

consistency.

D. Material Quality: Provide the manufacturer's best quality paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

2.02 COLORS

A. Colors will be provided by Pasco County Department of Facilities Management, to be matched by paint company of choice.

B. A sample of the selected color(s) shall be applied by the contractor to the building for color approval by owner or owner's agent.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin application until unsatisfactory conditions have been corrected.

1. Start of painting will be construed as acceptance of surfaces and job conditions.

3.02 PREPARATION

A. All surfaces to be painted shall be cleaned and prepared as specified. The painting contractor is responsible for the finish of his work. Should any surface be found unsuitable to produce a proper paint or sealing finish, the owner or owner's agent shall be notified, in writing, and no materials shall be applied until the unsuitable surfaces have been made satisfactory. Coating performance is affected by proper product selection, application, and surface preparation. Coating integrity and service life will be reduced because of improperly prepared surfaces. The selection and implementation of proper surface preparation ensures coating adhesion to the substrate and prolongs the service life of the coating system.

3.03 ALUMINUM

A. Remove all oil, grease, dirt, oxide, and other foreign material by use of solvents, emulsions, cleaning compounds, or steam cleaning. Change rags and solvent frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.

3.04 GALVANIZED METAL

A. Allow to weather a minimum of six months prior to coating. Solvent clean and then prime as required. When weathering is not possible or the surface has

been treated with chromate's or silicates, remove oil, grease, dirt, soil and other contaminates by use of solvents, emulsions, cleaning compounds, or steam cleaning. Change rags and solvents frequently. Apply paint to a test area, allow to dry one week and test for adhesion. If adhesion is poor, brush blasting is necessary to remove these treatments.

3.05 STEEL-STRUCTURAL, PLATE

A. Surface must be cleaned to remove oil, grease, dirt, soil, and other contaminates. Remove loose rust, loose mill scale, and other loose contaminates by hand tool cleaning or power tool cleaning.

3.06 METAL SURFACES - FACTORY PRIMED/FACTORY FINISHED

A. Surface must be cleaned to removed oil, grease, dirt, soil, and other contaminants. Glossy or slick factory primed/finished surfaces should be scuff-sanded or de-glossed before applying finish coat. Always follow metal manufacturer's instructions and recommendations BEFORE applying paint coating.

3.07 BLOCK, CINDER & CONCRETE - EXTERIOR OR INTERIOR

A. Must be free from dirt, loose or excess mortar, and thoroughly dry. Painting with a latex paint system may proceed in 30 days under normal drying and painting conditions.

3.08 STUCCO

A. Must be cleaned and free of any loose stucco and provide PH test shown fit for painting. If recommended procedures for applying stucco are followed, and normal drying conditions prevail, the surfaces may be painted with an exterior acrylic latex

paint after 14 days drying time.

3.09 CONCRETE, POURED-EXTERIOR OR INTERIOR

A. Concrete must be cured (at least 30 days at 75° F) prior to coating application. Concrete must be free from moisture as much as possible (seldom drops below 15%). Vapor pressures, temperature and humidity differentials, and hydrostatic pressures can cause coatings to prematurely fail. Presence of moisture prior to coating. Remove all grease, dirt, paint, oil, tar, glaze, latency, efflorescence, loose mortar and cement. Hollow areas, bug holes, honeycombs, voids, fins, form marks, and all protrusions or rough edges are to be ground or stoned to provide a smooth continuous surface of suitable texture for proper adhesion of the coating. Imperfections may require filing, as specified, with a material

compatible with the coatings. Hardeners, sealers, form release agents, curing compounds, and other concrete treatments must be compatible with the coatings.

3.10 CONCRETE FLOORS

A. The surface must be thoroughly clean and provide owner a vapor transmission test in accordance with ASTM E96-95. Test results and recommendation in installing water vapor transmission control is needed. Lifting, bleeding or peeling can occur because of incomplete surface preparation. Use of commercial detergents on concrete floors to remove grease and grime is required. Brush blasting of poured concrete or a 10% muriatic acid etch with thorough rinsing of concrete is required. Refer to ASTM D4260. Elimination of moisture in or beneath the concrete substrate is required before coating.

3.11 COMPOSITION BOARD (HARDBOARD) -- EXTERIOR

A. Whether factory primed or un-primed, exterior composition board siding (hardboard) must be cleaned thoroughly and primed with an exterior undercoater.

3.12 WOOD - EXTERIOR

A. Must be clean and dry. Prime and paint as soon as possible. No painting shall be done immediately after a rain or during foggy weather, or when the temperature is below 50° F. Knots and pitch streaks shall be scraped, sanded and spot primed before full priming coat is applied. All joints shall be caulked after prime coat is applied, nail holes or small openings shall be filled with wood filler before priming coat is

applied. Existing wood surfaces shall be carefully inspected for evidence of deterioration or surface imperfections. All deteriorated wood shall be replaced.

3.13 WOOD- - INTERIOR

A. Nail holes, cracks, and surface blemishes shall be filed and sanded smooth with the grain and never across it. Room shall be cleaned of dust and dirt before proceeding with paint coatings. Wood surfaces shall be lightly sanded after application and drying of prime coat to a smooth dull finish. Woodwork shall be caulked after primer coat is applied and before finish coat.

3.14 DRYWALL

A. Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with joint compound. Spackled nail heads and tape joints

must be sanded smooth and all dust removed prior to the application of the paint coating.

3.15 PLASTER

A. Must be allowed to dry thoroughly for at least 30 days before painting. Room must be ventilated while drying and in cold or damp weather, rooms must be heated. Damaged places must be repaired with patching paste. Bare plaster, new or old, should be dry, cured and hard. Textured or swirl types and soft, porous or powdery plaster should be treated with a solution of 1 pint of household vinegar in 1 gallon of water. Repeat until surface is hard. Rinse off with plain water and allow to dry.

3.16 CAULKING/PUTTY PROCEDURES

A. All construction joints, expansion joints, interior base boards, window and door perimeters shall be cleaned prior to caulking to assure desired adhesion to both surfaces. Joints include metal to metal, metal to masonry, masonry to masonry, wood to masonry, wood to wood, and wood to drywall.

B. All joints shall be carefully inspected for caulking deterioration, loss of adhesion, cracking or loss of properties. Failing caulk shall be removed and the area cleaned prior to re-caulking with specified caulk to assure desired adhesion to both surfaces.

C. Do not apply caulking when rain or temperatures below 40^{o} F are expected.

D. Apply caulk with conventional caulking gun or pressure equipment. Apply in continuous bead. Smooth and trim caulk with finger or appropriated tool immediately to ensure firm, full contact with the surfaces of the joint.

E. Putty / spackling compound shall be applied directly from the container using finger, putty knife or broad knife wider than the hole, crack, or indention being repaired. Force into repair with slight excess overlapping edges or repair. Let dry and sand with fine or medium sand paper or sanding block. For best results, priming may be required. Do not use putty or spackling compound in joints or crevices that flex or move.

3.17 MASONRY / STUCCO REPAIR PROCEDURE

A. Hairline or shrinkage cracks (1/32" or smaller). Coat affected area by applying one coat of an Elastomeric base compound paint at 7.0 wet mils.

B. Hairline or shrinkage cracks - (1/32" to 1/16") Elastomeric Patch compound. Smooth or texture depending on finish, generously over the center of the crack.
Use a broad knife or a brush and "feather" the material to either side of the crack so as to go from 1/16" to 0 over a 2" area.

3.18 INSPECTION AND SAMPLES

A. Wet film thickness will be checked with a properly calibrated wet firm thickness gauge or by specifically approved instruments.

B. It will be the paint contractor's responsibility to own and use a wit film gauge to check the application thickness as the painting proceeds. This method checked against volume soils and coverage rate is the best guide in determining what the dry film thickness will be.

C. A small sample area of each phase of the work shall be done and checked by a project representative. This will serve upon acceptance as the job standard for the remainder of that phase of work. This will also prevent misunderstandings as to interpretation of this specification's standards.

3.19 PAINT SCHEDULE

A. Interior Concrete Block:

1. 1st coat: PrepRite Int/Ext Latex Block Filler (B25w25).
2. 2nd coat: PrepRite 200 Interior Latex Primer (B28w200).
3. 3rd coat: ProMar 200 Interior Latex Semi-Gloss Enamel (B31W200 Series).

B. Interior Gypsum Drywall:

1. 1st coat: PrepRite 200 Interior Latex Primer (B28w200) (tinted).
2. 2nd coat: ProMar 200 Interior Latex Semi-Gloss Enamel (B31W200 Series).
3. 3rd coat: ProMar 200 Interior Latex Semi-Gloss Enamel.

C. Interior Wood - (Painted)

1. 1st coat: PrepRite Problock Latex Primer (B51W20).
2. 2nd coat: ProMar 200 Interior Latex Semi-Gloss Enamel (B31W200 Series).
3. 3rd coat: ProMar 200 Interior Latex Semi-Gloss Enamel (B31W200 Series).

D. Interior Wood - (Stained)

1. 1st coat: Wood Classics Interior Oil Stain (A49 Series).
2. 2nd coat: Wood Classics Polyurethane Varnish Satin or Gloss Finish (A67 Series).
3. 3rd coat: Wood Classics Polyurethane Varnish Satin or Gloss Finish (A67 Series).

E. Interior Ferrous Metals

1. 1st coat: Kem Kromik Universal Metal Primer (B50 Series).
2. 2nd coat: DTM Acrylic Semi-Gloss Coating (B66 Series).

F. Exterior Ferrous Metal (Not Galvanized)

1. 1st coat: Kem Kromik Universal Metal Primer (B50 Series).
2. 2nd coat: DTM Acrylic Semi-Gloss Coating (B66 Series).

G. Exterior Galvanized Metal

1. 1st coat: DTM Acrylic Primer/Finish (B66w1).
2. 2nd coat: DTM Acrylic Semi-Gloss Coating (B66 Series).
3. 3rd coat: DTM Acrylic Semi-Gloss Coating (B66 Series).

H. Exterior Stucco

1. 1st coat: Latex Block Filler.
2. 2nd coat: Exterior Latex Flat.
3. 3rd coat: Exterior Latex Flat.

I. Exterior Wood

1. 1st coat: A-100 Alkyd Wood Primer.
2. 2nd coat: A-100 Exterior Satin.
3. 3rd coat: A-100 Exterior Satin.

END OF SECTION 09900

SECTION 09965- SPECIAL WALL COATING SYSTEM

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Provide labor and materials for a seamless, non-pervious, chemical and abrasion resistant, epoxy/urethane wall coating, including surface preparation, primers, and finish coats.

1.02 RELATED SECTIONS

A. Concrete - Division 3.
B. Thermal & Moisture Protection -Division 7.

1.03 ACCEPTABLE MANUFACTURERS AND INSTALLERS

A. DUR-A-FLEX INC 1-800-253-3539.
B. Manufacturer approved Installer, who has technical qualifications, currently approved in writing, and facilities to install specified systems.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver material to job site in clean, clearly labeled containers and inspect prior to start of job.
B. Store material in a dry, enclosed area protected from the elements. Keep temperature of storage area between 60˚ and 90˚ F.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Verify that concrete had cured no less than 28 days under good conditions.

B. Verify that block wall mortar joints have cured no less than 7 days under good conditions.

C. Verify supply of adequate utilities, including electric, water, heat (between 60˚ and 90˚F.) and lighting of no less than 80 ft. candles measured at wall surface.

D. Free work area of other trades during, and for a period of 24 hours, after floor

installation.

E. Protect finished floor from damage by subsequent trades.

1.06 WARRANTY

A. Submit a one year warranty against defects in material and workmanship upon substantial completion of installation.

PART 2 PRODUCTS

2.01 A. A nominal 15 mil DUR-A-GARD Non-pervious, High-Build, Chemical Resistant, Epoxy/Urethane Wall Coating with POLY-THANE #3 performance topcoat as manufactured by DUR-A-FLEX INC. 1-800-253-3539.

2.02 PHYSICAL PROPERTIES

Property	Test Method	Result
Hardness (Shore D)	ASTM D-2240	70-80
Compressive Strength	ASTM D-695	16,000 psi
	ASTM C-579	10,500 psi
Tensile Strength	ASTM D-638	3,000 psi
	ASTM C-307	1,950 psi
Tensile Elongation	ASTM D-638	7.50%
Flexural Strength	ASTM D-790	4,000 psi
	ASTM C-580	2,900 psi
Flexural Modulus of Elasticity	ASTM D-790	5.5×10^5
Linear Shrinkage	ASTM D-2566	0.02%
Linear Expansion	ASTM D-696	$2X10^{-5}$
Bond Strength to Concrete	ASTM D-4541	400 psi substrate fails
Indentation	ML D-3134	.025 MAX
Impact Resistance	ML D-3134	Pass
Water Absorption	ASTM D-570	0.40%
Heat Resistance Limitation		140˚F-200˚F
Flammability	ASTM D-570	Self Extinguishing
Flame Spread/NFPA 101	ASTM E-84	Class B
Abrasion Resistance	ASTM C-501	
CS17 Wheel 1000GM Load 1000 Cycles		35 mg loss

2.03 PRODUCT MIXING

A. Mix on site with manufacturer supplied mix and measure apparatus to ensure a timely, accurate mix ratio and minimize waste.

PART 3 EXECUTION

3.01 PREPARATION

A. Remove loose mortar spatter, joint compound, etc.
B. Create a surface profile on concrete with sandblast apparatus and/or dust-free diamond grinders.
C. Verify that surface is dry and perfectly clean, free of all oil, grease, detergent film, form agents, sealers and/or curing compounds.
D. Masonry block shall be clean, dry and coated with a high solids block filler.
E. Drywall shall be completely clean and free of any oils, soap residue, gypsum dust, etc.

3.02 INSTALLATION

A. Adhere strictly to manufacturer's cement written instructions.
B. Apply prime coat of **DUR-A-POXY #200** or **DUR-A-POXY #245** at 200 Sq. FT. Per gallon with a quality non shed roller, and allow to cure.
C. Apply body coat of **DUR-A-GARD NO-SAG** at 300 Sq. Ft. per gallon with a quality non shed roller, and allow to cure.
D. Apply topcoat of **POLY-THANE #3** at 300 Sq.Ft. per gallon with a quality non shed roller, and allow to cure.
E. Dispose of application debris properly.

3.03 DETAILS

A. Pre-patch surface deviations with patching compound comprised of 100% solids epoxy/aggregate.

END OF SECTION 09655

SECTION 10200 -METAL LOUVERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Section 15890 - Ductwork

B. Section 15910 - Ductwork Accessories.

C. Section 15936- Air outlets and inlets.

1.02 SCOPE OF WORK

A. Provide weather louver to protect air intake and exhaust in building exterior walls. Louver shall be equipped with drain gutter in the head member and horizontal blades to channel water to the louver side frame or jambs where water if further channeled through vertical downspout and out at the sloped louver sill.

1.03 REFERENCES

A. AMCA Water Penetration Test.

B. AMCA Licensed performance data.

1.04 SUBMITTALS

A. Submit shop drawings and manufacturer product data under provisions of General Conditions and Supplementary General Conditionals.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Greenheck ESD - 403 High Performance Drainable Blade louver or approved equal.

2.02 STATIONARY TYPE EXTERIOR LOUVER:

A. Frame: Heavy gauge 6063T5 extruded aluminum, 4" x 0.081" nominal dimensions.

B. Blades: Drainable design, 6063T5 extruded aluminum, .081" nominal wall thickness, position at 37^{o} and 45^{o} angles on approximately 4" centers.

C. Birdscreen: 3/4" x 0.051" flattened expanded aluminum in removable frame. Screen is mounted on inside.

D. Insect screens: Louver manufacturer suppled aluminum insect screens.

2.03 FINISH

A. Louvers shall be supplied with a Kynar finish applied following a thorough cleaning and pretreatment of the metal surface. Dry film thickness of the Kynar shall be approximately 1.2 mils after baking at 450o F. Color shall be selected by Architect.

2.04 QUALITY ASSURANCE

A. Each factory assembled louver section shall be designed to withstand wind load of 25 pounds per square foot (100 mph). Wind equivalent louver frames mu and section joints shall be adequately supported from the building structure to withstand this same wind load.

B. Louver performance data shall be licensed under the AMCA Certified Ratings Program and shall bear the AMCA Certified Rating seal. This certified performance data shall include air flow pressure loss and water penetration and shall demonstrate performance equal to or better than the Greenheck Model specified.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Louvers meeting the above specifications shall be furnished and installed where shown on the plans and as described in schedules with proper caulking all the joints.

END OF SECTION 10200

SECTION 10440 - SPECIALTY SIGNS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Extent of signs is either shown on the drawings and/or specified herein.

B. Forms of specialty signs required include the following:

1. Plastic room identification signs at each room in facility.
2. Brass channel letters non lit 14" height for building exterior. Refer to drawings.

C. Illuminated exit signs, electrical service and connections for illuminated exit signs are in Division 16 - Sections.

1.02 SUBMITTALS

A. Submit shop drawings under provisions of Section 01300.

B. Submit shop drawings listing sign styles, lettering and locations, and overall dimensions of each sign type. Include plans elevations, large scale details of sign wording and lettering layout. Show anchorage and accessory items.

C. Product Data: Submit manufacturer's technical data for each type or specialty sign, including evidence of five (5) years experience in producing products of similar design and quality.

D. Samples: Submit samples of each sign form and material showing finishes, colors, surface textures and qualities of manufacture and design of each sign component including graphics.

1. If requested by Architect, submit full-size units or units for review by Architect. Full size unit or units found acceptable by Architect may be installed as part of the Work.

E. Submit two (2) samples illustrating full size sample sign, of type, style and color specified including method of attachment.

F. Submit manufacturer's installation instructions under provisions of Section 01300.

1.03 QUALITY ASSURANCE

A. Uniformity of Manufacturer: Each sign form and graphic image process shall be the product of a single manufacturer to produce specialty signs of uniform quality, form and finish.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Section 01600.

B. Store and protect products under provisions of Section 01600.

C. Package signs labeled in name groups.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not install signs when ambient temperature is below 70 degrees F. Maintain this minimum during and after installation of signs.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, provide products of one of the following for each type:

1. Manufacturers of Panel Signs:

a) APCO Graphics, Inc.
b) Architectural Graphics, Inc.
c) ASI Sign Systems, Inc.
d) Desk and Door Nameplate Company
e) Mohawk Sign Systems
f) Substitutions: Under provisions of Section 01600.

B. Room Identification Signs: Solid color acrylic plastic, radiused corner, 1/8" thick background panel snap fit to 1/8" thick screw-mounted backup plate. Color as selected. Type and pictograms shall be raised 1/32" and be of a contrasting color.

Braille shall be Grade 2.

2.02 LETTERING

A. Size and Style: Sizes as indicated. Lettering shall be uppercase Helvetica.

2.03 ACCESSORIES

A. Mounting Hardware: Standard stainless steel fasteners as required.

END OF SECTION 10440

SECTION 10800 - TOILET ACCESSORIES

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 Work of this section.

1.02 DESCRIPTION OF WORK

A. Extent of each type of toilet accessories required include the following:

1. Toilet tissue dispensers - see drawings for locations.
2. Grab bars - see drawings for locations.
3. Mirrors - stainless steel, angle framed - see drawings for locations.
4. Robe hooks - all baths - mounted into toilet compartments.
5. Mechanical roll towel dispenser - See drawing for location.
6. Hand care soap dispenser - See drawing for location.
7. Bath tissue dispenser - See drawing for location.

1.03 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

1.04 SUBMITTAL

A. Product Data: Submit manufacturer's technical data and visual cut sheets and installation instructions for each toilet accessory.

B. Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices in other work.

C. Submit full range of color selections and options.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide toilet accessories by one of the following:

1. Accessory Specialties, Inc.
2. Bobrick Washroom Equipment, Inc.
3. Bradley Corporation.
4. McKinney/Kidde, Inc.
5. The Charles Parker Co.
6. Watrous, Inc.
7. Ketchum Bathroom Equipment.
8. Gamco.

2.02 MATERIAL, GENERAL

A. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

2.03 FABRICATION

A. General: Stamped names or labels on exposed faces of toilet accessory units are not permitted, except where otherwise indicated; unobtrusive labels on surfaces not exposed to view are acceptable.

B. Surface-mounted Toilet Accessories: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edged rolled. Provide concealed anchorage wherever possible.

C. Recessed Toilet Accessories: Except where otherwise indicated, fabricate units of all welded construction, without mitered corners.

2.04 GRAB BARS

A. Chrome Plated: Provide grab bars with wall thickness not less than 18 gauge and as follows:

1. Mounting: Concealed, manufacturer's standard flanges and anchorages.
2. Clearance: 1-1/2" clearance between wall surface and inside face of bar.

3. Gripping Surfaces: Manufacturer's standard non-slip texture.
4. Heavy Duty Sizes: 1-14/" outside diameter with wall thickness not less than 16 gauge.
5. Length: See drawings for size and location.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install toilet accessory units in accordance with manufacturer's instructions using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

3.02 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces after removing labels and protective coatings.

3.03 ACCESSORIES

A. Prior to final inspection and turnover of Project, Contractor to stock all of the toilet accessories with the appropriate items; i.e. toilet tissue, paper towels, hand soap. Turn over any access products to the Owner.

END OF SECTION 10800

SECTION 13122 - METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This section includes four (4) single-story, single-span, rigid-frame-type pre-engineered metal roof

1. Two (2) roof systems consists of manufacturers standing seam galvalume roof panel.
2. Two (2) roof systems consist of metal roof of 16" wide, 24 gauge standing seam roof panels with Kynar 500 Finish.
3. Manufacturer's standard building components and accessories may be used, provided components, accessories, and complete structure conform to design indicated and specified requirements.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Concrete floor and foundations and reinforced unit masonry systems.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Engineer, design, fabricate and erect the pre-engineered metal building system to withstand loads from winds, gravity, structural movement including movement thermally induced, and to resist in-service use conditions that the building will experience, including exposure to the weather, without failure. Complete design of structural connections to masonry bearing walls a requirement of this specification.

1. Design each member to withstand stresses resulting from combinations of loads that produce the maximum allowable stresses in that member as prescribed in MBMA's "Design and Practices Manual".

B. Design Loads: The building shall be designed in accordance with the Florida Standard Building Code 2004 with supplement 2006.

1. Basic design loads include live load and wind load, in addition to the dead load. Design wind load velocity: 150 mph.
2. Collateral loads include additional dead loads over and above the weight of the metal building system such as rood-suspended mechanical systems and operable partitions.
3. Roof: 20 PSF with tributary reduction allowed.

C. Structural Framing and Roof: Design primary and secondary structural members and exterior covering materials for applicable loads and combinations of loads in accordance with the Metal Building Manufacturers Association's (MBMA) "Design Practices Manual".

1. Structural Steel: Comply with the American Institute of Steel Construction's (AISC) "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" for design requirements and allowable stresses.
2. Light Gage Steel: Comply with the American Iron and Steel Institute's (AISI) "Specification for the Design of Cold Formed Steel Structural Members" and "Design of Light Gage Steel Diaphragms" for design requirements and allowable stresses.
3. Welded Connections: Comply with the American Welding Society's (AWS) "Standard Code for Arc and Gas Welding in Building Construction" for welding procedures.

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.

1. Product data consisting of metal building system manufacturer's product information for building components and accessories.
2. Shop drawings for metal building structural framing system, roofing and siding panels, and other metal building system components and accessories that are not fully detailed or dimensioned in manufacturer's product data.

a) Structural Framing: Furnish complete erection drawings prepared by or under the supervision of a professional engineer legally authorized to practice in the jurisdiction where the Project is located. Include

details showing fabrication and assembly of the metal building system. Show anchor bolts settings and sidewall, endwall, and roof framing. Include transverse cross-sections.

b) Roofing, Soffit and Fascia: Provide layouts of panels on walls and roofs, details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashings, closures, and special details.

Include transverse cross-sections.

c) Building Accessory Components: Provide details of metal building accessory components to clearly indicate methods of installation including the following:

1) Sheet Metal Accessories: Provide layouts at 1/4-inch scale. Provide details of ventilators, louvers, gutters, downspouts, and other sheet metal accessories at not less than 1-1/2 inch scale showing profiles, methods of joining, and anchorages.

3. Samples for initial selection purposes in form of manufacturer's color charts or chips showing full range of colors, textures, and patterns available for metal roofing and siding panels with factory-applied finishes. Six standard colors shall be available for selection of each item.
4. Samples for verification purposes of roofing and siding panels. Provide sample panels 12-inch long by actual panel width, in the profile, style, color, and texture indicated. Include clips, battens, fasteners, closures, and other panel accessories.
5. Installer certificates signed by metal building manufacturer written certification certifying that the installer complies with requirements included under the "Quality Assurance" Article.
6. Professional engineer's certificate prepared and signed by a Professional Engineer, legally authorized to practice in the jurisdiction where Project is located, verifying that the structural framing and covering panels meets indicated loading requirements and codes of authorities having jurisdiction.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to erect the pre- engineered metal building who has specialized in the erection and installation of types of metal buildings systems similar to that required for this Project and who is certified in writing by the metal building system manufacturer as qualified for erection of the

manufacturer's products.

B. Manufacturer's Qualifications: Provide pre-engineered metal buildings manufactured by a firm experienced in manufacturing metal buildings systems that are similar to those indicated for this Project and have a record of successful in-service performance.

C. Single-Source Responsibility: Obtain the metal building system components, including structural framing, wall and roof covering, and accessory components, from one source from a single manufacturer.

D. Design Criteria: The drawings indicate sizes, profiles, and dimensional requirements of the pre-engineered metal building system. Metal building systems having equal performance characteristics with deviations from indicated dimensions and profiles may be considered, provided deviations do not change the design concept or intended performance. The burden of proof for equality is on the proposer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver prefabricated components, sheets, panels, and other manufactured items so they will not be damaged or deformed. Package wall and roof panels for protection against transportation damage.

B. Handling: Exercise care in unloading, storing, and erecting wall and roof covering panels to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight ventilated covering. Store metal wall and roof panels so that water accumulations will drain freely. Do not store panels in contact with other materials that might cause staining, denting or other surface damage.

1.07 WARRANTY

A. Roofing Finish Warranty: Furnish the roofing panel manufacturer's written warranty, covering failure of the factory-applied exterior finish on metal roof panels within the warranty period. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

1. Warranty period for factory-applied exterior finishes on roof panels is twenty (20) years after the date of Substantial Completion.

B. Metal Building Structure and Metal Roof Warranty: manufacturers representative shall inspect and certify the metal building structure and metal roof installation and issue to owner a one year material and labor warranty to the owner for metal building system.

C. Weathertightness Warranty: Furnish manufacturer's weathertightness written warranty which guarantees the Dealer's performance that the Dealer will repair or stop any roof leaks identified in the described building. Warranty period is twenty (20) years after the date of Substantial Completion.

1.08 EXTRA MATERIALS

A. Maintenance Stock: Furnish at least 5 percent excess over required amount of nuts, bolts, screws, washers, and other required fasteners for each metal building. Pack in cartons labeled to identify the contents and store on the site where directed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: The building shall be manufactured by an AISC certified manufacturer (Classification MB). Subject to compliance with requirements, manufacturers offering metal building systems that may be incorporated in the Work include the following:

1. A & M Building Systems, Inc.
2. A & S Building Systems, Inc.
3. American
4. Atlantic Building Systems.
5. Butler Manufacturing Co.
6. Ceco Buildings Division.
7. Gulf States Manufacturers, Inc.
8. Kirby Building Systems, Inc.
9. Pascoe
10. Southern Structures, Inc.
11. Star Buildings Division, H.H. Robertson Co.
12. Varco-Pruden Buildings.
13. Whirlwind Steel Buildings.
14. OSI Building System

2.02 MATERIALS

A. Hot-rolled Structural Steel Shapes: Comply with ASTM A 36 or A 529.

B. Steel Tubing or Pipe: Comply with ASTM A 500, Grade B, ASTM A 501, or ASTM A 53.

C. Steel Members Fabricated from Plate or Bar Stock: Provide 42,000 psi minimum yield strength. Comply with ASTM A 529, ASTM A 570, or ASTM A 572.

D. Steel Members Fabricated by Cold Forming: Comply with ASTM A 607, Grade 50.

E. Cold-Rolled Carbon Steel Sheet: Comply with requirements of ASTM A 366 or ASTM A 568.

F. Hot-Rolled Carbon Steel Sheet: Comply with requirements of ASTM A 568 or ASTM A 569.

G. Structural Quality Zinc-Coated (Galvanized) Steel Sheet: Comply with ASTM A 446 with G90 coating complying with ASTM A 525. Grade to suit manufacturer's standards.

H. Bolts for Structural Framing: Comply with ASTM A 307 or ASTM A 325 as necessary for design loads and connection details.

I. Thermal Insulation: Glass fiber blanket insulation (0.5 pcf density), complying with ASTM C991 of sufficient thickness to provide a minimum R- value of 19, with 4 inch wide continuous vapor-tight edge tabs, and with UL flame spread classification of 25 or less.

1. Vapor Barrier: Vinyl film.

J. Paint and Coating Materials: Comply with performance requirements of the federal specifications indicated. Unless specifically indicated otherwise, compliance with compositional requirements of federal specifications indicated is not required.

K. Shop Primer for Ferrous Metal: Fast-curing, lead-free, universal primer, selected by the manufacturer for resistance to normal atmospheric corrosion, compatibility with finish paint systems, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure. Comply with FS TT-P-645.

2.03 STRUCTURAL FRAMING

A. Rigid Frames: Fabricated from hot-rolled structural steel shapes. Provide factory-welded, shop-painted, built-up "I-beam" shape or open-web-type frames consisting of tapered or parallel flange beams and tapered columns. Furnish frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly.

1. Provide length of span and spacing of frames indicated. Slight variations in length of span and frame spacing may be acceptable if necessary to meet manufacturer's standard.

B. Secondary Framing: Provide the following secondary framing members:

1. Roof Purlins: "C" or "Z"- shaped sections fabricated from 16 gage (0.0598-inch) shop-painted roll-formed steel. Purlin spacers shall be fabricated from 14-gage (0.747-inch) cold-formed galvanized steel sections.
2. Eave Struts: Unequal flange "C"-shaped sections formed to provide adequate backup for both wall and roof panels. Fabricate from 16- gage (0.0598-inch) shop-painted roll-formed steel.
3. Flange and Sag Bracing: 1-5/8 x 1-5/8 inch angles fabricated from 16- gage (0.0598-inch) shop-painted roll-formed steel.

C. Wind Bracing: Provide adjustable wind bracing using 5/8 inch diameter threaded steel rods (min.); comply with ASTM A 36 or ASTM A 572, Grade D.

D. Bolts: Provide shop-painted bolts except when structural framing components are in direct contact with roofing and siding panels. Provide zing-plated bolts when structural framing components are in direct contact with roofing and siding panels.

E. Shop Painting: Clean surfaces to be primed of loose mill scale, rust, dirt, oil, grease, and other matter precluding paint bond. Follow procedures of SSPC- SP7 for brush-off blast cleaning, and SSPC-SP1 for solvent cleaning.

1. Prime structural steel primary and secondary framing members with the manufacturer's standard rust-inhibitive primer.
2. Prime galvanized members, after phosphoric acid pretreatment, with manufacturer's standard zinc dust-zinc oxide primer.

2.04 ROOFING, FASCIA AND SOFFIT PANELS

A. Fascia and Soffit Panels: Fabricate wall panel face sheets to the profile or configuration indicated from 24-gage (0.0179-inch), structural quality, Grade C, zinc-coated steel sheets. Fascia and soffits shall be interlocking flat panels with low profile seams. Soffit panels to be vented type, all anchorage to be concealed. All fascia and soffit panels shall be coated with Kynar 500 as a top coating .80 mil thick over a primer of .20-.25 mil thickness, for a total film thickness of 1 mil. The interior side of the panels shall have a wash backer coat of .50 - .65 thickness. Color choice shall be from a manufacturer's standard colors. Provide a minimum of six (6) standard colors. No additional charges will be allowed for the selection of the white finish.

B. Standing Seam Roof Panels: Manufacturer's standard structural non- substructure supported factory-formed standing-seam "flat pan" roof panel system designed for mechanical attachment of panels to roof purlins using a concealed clip. Form panels of 24-gage (0.0239-inch), Grade C, zinc-coated steel sheets.

1. Painted with Kynar 500 as a top coating .70 - .80 mil thick over a primer of .20 - .25 mil thickness, for a total film thickness of 1 mil. The interior side of the panels shall have a wash backer coat of .50 - .65 mil thickness. Color choice shall be from manufacturer's standard colors. Provide a minimum of six (6) standard colors.
2. Clips: Provide 16-gage (0.0598-inch) panel clips.
3. Cleats: Factory-caulked, mechanically seamed cleats formed from 24- gage (0.0239-inch), Grade C, zinc-coated steel sheets.

C. Structural stand seam (apparatus bays):

1. Manufacturers standard structural non-substructure supported factory formed standing seam "Trapezoidal" roof panel designed for mechanical attachment of panels to roof purlins using a concealed clip. 360 degree "Pittsburgh seam". 24 gauge (0.0239) 50,000 P.S.I. zinc coated steel sheets.
2. Panel width 24", trapezoidal leg 3".
3. Clips: 14 gauge base/24 upper clip galvanized steel. Seamed into the panel side lap.
4. Finish: Galvalume confirming to ASTM A792-89 with a coating class of AZ 55. Chemically treated and lightly oiled, grade 508.

D. Standing Seam Ridge Panels: Ridge panel shall be 10'-0" one-piece die formed to match the configuration of the roof panel and the roof slope. Ridge panel shall be of same material and coating as roof panel. A continuous weather-tight seal shall be

provided with caulk and mastic. Spacing and quantity shall be determined by metal building manufacturer.

E. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets, self-locking bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.

1. Provide metal-backed neoprene washers under heads of fasteners bearing on weather side of panels.
2. Use aluminum or stainless steel fasteners for exterior application and galvanized or cadmium-plated fasteners for interior applications.
3. Locate and space fastenings in true vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.
4. Provide fasteners with heads matching color of roofing or siding sheets by means of plastic caps or factory-applied coating.

E. Accessories: Provide the following sheet metal accessories factory-formed of the same material in the same finish as roof and wall panels:

1. Flashings.
2. Closers.
3. Fillers
4. Ridge covers.
5. Fascias.

F. Flexible Closure Strips: Closed-cell, expanded cellular rubber, self- extinguishing flexible closure strips. Cut or premold to match configuration of roofing and siding sheets. Provide closure strips where indicated or necessary to ensure weathertight construction.

G. Sealing Tape: Pressure-sensitive 100 percent solid grey polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, non-sag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

H. Joint Sealant: One-part elastomeric polyurethane, polysulfide, or silicone rubber sealant as recommended by the building manufacturer.

2.05 SHEET METAL ACCESSORIES

A. General: Provide coated steel sheet metal accessories with coated steel roofing and siding panels.

2.06 FABRICATION

A. General: Design prefabricated components and necessary field connections required for erection to permit easy assembly and disassembly.

1. Fabricate components in such a manner that once assembled, they may be disassembled, repackaged, and reassembled with a minimum amount of labor.
2. Clearly and legibly mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.

B. Structural Framing: Shop-fabricate framing components to indicated size and section with base plates, bearing plates, and other plates required for erections, welded in place. Provide holes for anchoring or connections shop- drilled or punched to template dimensions.

1. Shop Connections: Provide power riveted, bolted, or welded shop connections.

2. Field Connections: Provide bolted field connections.

PART 3 - EXECUTION

3.01 ERECTION

A. Framing: Erect framing true to line, level, plumb, rigid, and secure. Level base plates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use a nonshrinking grout to obtain uniform bearing and to maintain a level base line elevation. Moist cure grout for not less than seven (7) days after placement.

B. Purlins and Girts: Provide rake or gable purlins with tight-fitting closure channels and fascias. Locate and space wall girts to suit door and window arrangements and heights. Secure purlins and girts to structural framing and hold rigidly to a straight line by sag rods.

C. Bracing: Provide diagonal rod or angle bracing in roof as indicated.

1. Reinforced masonry shear walls shall be used in lieu of sidewall rod bracing.
2. Rod or angle bracing will be required to provide roof diaphragm strength to

resist wind forces.

D. Framed Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to building structural frame.

3.02 ROOFING

A. General: Arrange and nest sidelap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line. Protect factory finishes from damage.

1. Field cutting of exterior panels by torch is not permitted.
2. Provide weatherseal under ridge cap. Flash and seal roof panels at eave and rake with rubber, neoprene, or other closures to exclude weather.

B. Standing-Seam Roof Panel System: Fasten roof panels to purlins with concealed clip in accordance with the manufacturer's instructions.

1. Install clips at each support with self-drilling fasteners.

2. At end laps of panels, install tape calk between panels.
3. Install factory-caulked cleats at standing-seam joints. Machine-seam cleats to the panels to provide a weathertight joint.

C. Fascia and Soffit Sheets: Apply elastomeric sealant continuously between metal trim and stucco and elsewhere as necessary for waterproofing. Handle and apply sealant and backup in accordance with the sealant manufacturer's recommendations.

1. Align bottom of wall panels and fasten panels with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
2. Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in pre-drilled holes.

D. Sheet Metal Accessories: Install ventilators, louvers, and other sheet metal accessories in accordance with manufacturer's recommendations for positive anchorage to building and weathertight mounting. Adjust operating mechanism for precise operation.

E. Thermal Insulation: Install insulation concurrently with installation of roof panels in accordance with manufacturer's directions. Install blankets straight and true in one-piece lengths with both sets of tabs sealed to provide a complete vapor barrier. Locate insulation on underside of roof sheets, extending across the top flange of purlin members and held taut and snug to roofing panels with retainer clips.

F. Cleaning and Touch-Up: Clean component surfaces of matter that could preclude paint bond. Touch up abrasions, marks, skips, or other defects to shop-primed surfaces with same type material as shop primer.

END OF SECTION 13122

SECTION 15010 - BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Basic Mechanical Requirements specifically applicable to Division 15 Sections, in addition to Division 1 - General Requirements, General Conditions and Supplementary General Conditions.

B. This Division of the specifications includes mechanical;

1. Heating, ventilating, air conditioning (HVAC).
2. Plumbing, and that mechanical which applies to heating, ventilating, air conditioning, and plumbing.

1.02 INTENT

A. It is the intention of these specifications and drawings to call for finished Work, tested, and ready for operation. Wherever the word "provide" is used, it shall mean "furnish and install complete and ready for use".

B. Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the Work, the same as if herein specified or shown.

1.03 SURVEYS AND MEASUREMENTS

A. Base all measurements, both horizontal and vertical, from established bench marks. All Work shall agree with these established lines and levels. Verify all measurements at site and check the correctness of same as related to the Work.

1.04 DRAWINGS

A. Drawings are diagrammatic and indicate the general arrangement of systems and Work included in the Contract. Drawings are not to be scaled. The architectural drawings and details shall be examined for exact location of fixtures and equipment. Where they are not definitely located, this information shall be obtained from the Architect.

B. If directed by the Architect or Engineer, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with Work of other trades or for proper execution of the Work.

C. At the time of each shop drawing submission, the Contractor shall call the Engineer's attention (in writing) to, and plainly mark on shop drawings, any deviations from the Contract Documents. (See paragraph 1.06, B.)

D. Samples, drawings, specifications, catalogs, submitted for approval, shall be properly labeled indicating specific service for which material or equipment is to be used, location, section and article number of specifications governing, Contractor's name, and name of job. All equipment shall be labeled to match labeling on Contract Documents.

E. Control systems: Submit description of operation and schematic drawings of the entire control system. Include bulletins describing each item of control equipment or component.

F. Catalogs, pamphlets, or other documents submitted to describe items on which approval is being requested, shall be specific and identification in catalog, pamphlet, etc. of item submitted shall be clearly made in ink. Data of a general nature will not be accepted.

G. Approval rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are approved, said approval does not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing Work as required by the contract drawings and specifications.

H. All shop drawings shall be submitted to the Architect/Engineer by Contractor no later than thirty (30) days from the day of contract award.

I. Failure of the Contractor to submit shop drawings in ample time for checking shall not entitle him to an extension of contract time, and no claim for extension by reason of such default will be allowed.

J. Submit all Division 15 submittals at one time in one integral group. Piece- by-piece submission of individual items will not be acceptable. Engineer may check contents of each submittal set upon initial delivery; if not complete as set forth herein, submittal sets may be returned to Contractor without review and approval and will not be accepted until made complete.

K. Routing and methods of support of piping shall be shown on shop drawings and shall have the review of the Engineer prior to fabrication and installation. Spacing of supports shall be as specified in Section 15140, or if not specified, shall not exceed the suggested maximum spacing recommended in ANSI B31.1 for each type of line. Supports shall be fabricated as detailed on reviewed shop drawings.

Provide supports so located that temporary supports are not required during removal of valves or equipment. Insofar as possible, support lines directly from Building structure.

L. At the close of the job, prior to final review, five (5) bound copies of the following shall be submitted by transmittal letter to the Engineer for review and acceptance.

1. Equipment warranties.
2. Contractor's warranty.
3. Parts list and manuals for all equipment.
4. Balance and test readings.
5. Operating instructions (in writing).
6. Written instructions on maintenance and care of the system.

1.05 SUBMITTALS

A. Submit manufacturer's published technical data, catalog cuts, wiring diagrams, shop drawings, samples and testing and balancing logs for all elements of the HVAC Work. Submit under provisions of General Conditions and Supplementary General Conditions.

B. No equipment, piping, ductwork or components shall be fabricated, delivered, erected, or connected other than from shop drawings reviewed and approved by the Engineer.

C. It shall be understood that review of shop drawings by the Engineer does not supersede the requirement to provide a complete and functioning system in compliance with the Contract Documents.

D. Equipment Supports: Submit detailed shop drawings indicating equipment weight and dimensions, support material, connections, anchoring, and vibration isolation.

E. Submittals shall include, but not be limited to, the following:

1. All equipment; cooling, heating, plumbing, electrical motors, starters, controls, etc.
2. Voltage, phase, and amps of each electrical item, such as motors, etc.
3. All auxiliary equipment.
4. Pipe, ductwork, valves, insulation, etc.

1.06 SUBSTITUTIONS

A. Materials and equipment are specified herein by a single or by multiple

manufacturers to indicate quality and performance required. The drawings are based upon equipment scheduled on drawings and specified. If another manufacturer is considered for substitution during the bidding process, the Mechanical Contractor shall be responsible for coordinating all electrical, mechanical, structural, or architectural changes. Comparable equipment manufacturers which are listed as equals shall be considered as substitutes. Manufacturers other than the basis of design shall submit a catalog information and 1/4" scale plan and section drawings showing proper fit and all clearances for maintenance items.

B. Substitutions of other manufacturers will be considered for use if, in the Engineer's opinion, the item requested for substitution is equal to that specified. The Contractor shall provide to the Engineer a typed comparative list of the basis of design and the proposed substitute. The comparative shall list capacities, pressure drops, horse power, electrical requirements, etc., (refer to paragraph 1.04, C and 1.06, C).

Request for approval of substitutions or equals prior to bid must be made in writing. The approval of any substitutions or equals prior to bid shall not be construed as a shop drawing approval. The substitute or equal must be submitted as described in the specifications and meet all the requirements of the specifications and drawings.

C. All requests for substitutions shall be submitted as described in paragraph 1.06, B., and specifically indicate any and all differences or omissions between the product specified as basis of design and the product proposed for substitution. Differences shall include but shall not be limited to data as follows for both the specified and substituted products.

1. Principle of operation.
2. Materials of construction or finishes.
3. Thickness or gauge of materials.
4. Weight of item.
5. Deleted features or items.
6. Added features or items.
7. Changes in other Contractor's Work caused by the substitution.
8. Physical dimensions.
9. Electrical requirements.

D. Where the Contractor proposes to use an item of equipment other than that specified or detailed on the drawing, which requires any redesign of the structure, partitions, foundations, piping, wiring, or any other part of the mechanical or electrical, all such redesign, and all new drawings and detailing required therefore, shall be prepared by the Subcontractor at his own expense and submitted to the Architect/Engineer for approval.

E. Where such approved deviation requires quantity and arrangement of ductwork,

piping, wiring, conduit, and equipment from that specified or indicated on the drawings, the Contractor shall furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

1.07 COOPERATION WITH OTHER TRADES

A. Give full cooperation to other trades and furnish in writing to the General Contractor, with copies to the Architect, any information necessary to permit the Work of all trades to be installed satisfactorily and with the least possible interference or delay.

B. When work installed under this Division will be in close proximity to, or will interfere with Work of other trades, assist in working out space conditions to make a satisfactory adjustment. If so directed by the Architect/Engineer, prepare composite working drawings and sections at a suitable scale not less than 1/4" = 1'-0", clearly showing how Work is to be installed in relation to the Work of other trades. If the Work is installed before coordinating with other trades, or so as to cause any interference with Work of other trades, make all the necessary changes in Work to correct the condition without extra charge.

C. Furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of Work and for the purpose of coordinating adjacent Work.

1.08 PROTECTION

A. Protect all Work and material provided under this Division from damage. All damaged equipment Work or material provided under this Division shall be replaced with new. Rebuilts are not acceptable.

B. Protect all Work and equipment until inspected, tested, and accepted. Protect Work against theft, injury, or damage; and carefully store material and equipment received on site which are not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of obstructing material

1.09 SCAFFOLDING, RIGGING, HOISTING

A. Provide all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.

1.10 REMOVAL OF RUBBISH

A. This Contractor shall at all times keep premises free from accumulations of waste materials or rubbish caused by his employees or Work. At completion of Work he shall remove all his tools, scaffolding, materials, and rubbish from the building and site. He shall leave the premises and his Work in a clean, orderly and acceptable condition.

B. All plaster, concrete, cement, etc. shall be removed from all pipe, hangers, and equipment prior to painting and/or concealment.

1.11 SAFETY

A. This Contractor shall comply with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.333), Title 29 - Labor, Chapter XIII, Bureau of Standards, Department of Labor, Part 1518 - Safety and Health Regulations for Construction; and that his housekeeping and equipment be maintained in such a manner that they comply with the Florida Industrial Commission Safety Code and Regulations of the Federal Williams - Steiger Occupational Safety and Health Act of 1970 (OSHA), wherein it states that the Contractor shall not require any laborer or mechanic employed in the performance of the contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety.

1.12 SUPERVISION

A. This Contractor shall provide a competent, experienced, full time Superintendent who is acceptable to the Architect/Engineer and Owner, and who is authorized to make decisions on behalf of the Contractor.

1.13 LUBRICATION

A. Where necessary, provide means for lubricating all bearing and other machine parts. If a part requiring lubrication is concealed or inaccessible, extend a lubrication tube with suitable fitting to an accessible location and suitably identify it.

B. After installation, properly lubricate all parts requiring lubrication and keep them adequately lubricated until final acceptance by the Owner.

1.14 VALVE CHARTS, TAGS, AND NAME PLATES

A. Provide at a location designated by the Architect/Engineer and the Owner, a valve chart laminated on wood or enclosed in a sturdy glazed frame. Chart shall show the designated number of each valve, its location and service.

Valve numbers shall be same as those shown on the "As-Built" drawings.

B. Each valve shown on the chart shall have a 1-1/2" diameter, 18 gauge brass tag with clearly visible stamped numbers, securely fastened to the valve stem or handle with a heavy brass hook or chain.

C. Each panel mounted switch, thermometer, gauge, or controller for fans, pumps, or other electrically operated equipment shall be clearly designated by a black plastic nameplate of size approved by the Architect/Engineer securely fastened with metal pins or screws to the panel directly under the item designated.

1.15 WIRING DIAGRAMS

A. Furnish for use under Division 16 all wiring diagrams as may be required for the installation of the wiring to insure proper operation and control of the equipment provided under this Division. Provide the diagrams in time to avoid delays.

1.16 MATERIAL AND WORKMANSHIP

A. All materials and apparatus required for the Work, except as specifically specified otherwise, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind of quality of material is given, a first-class standard article as approved by the Architect/Engineer shall be furnished. Refer to substitutions in this Section.

B. Unless otherwise specifically indicated on the plans or specifications, all equipment and materials shall be installed with the approval of the Architect/Engineer in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.

1.17 QUIET OPERATION AND VIBRATION

A. All Work shall operate under all conditions of load without any sound or vibration which is objectionable in the opinion of the Architect/Engineer and the Owner. In case of moving machinery, sound, or vibration noticeable outside of room in which it is installed, or annoyingly noticeable inside its own room, will be considered objectionable. Sound or vibration conditions considered objectionable by the Architect/Engineer and the Owner shall be corrected in an approved manner at no additional expense to the Owner. Vibration control shall be by means of approved vibration eliminators.

1.18 ACCESSIBILITY

A. This Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate clearance in double partitions and hung ceilings for the proper installation of his Work. he shall cooperate with all other Contractors whose Work is in the same space, and shall advise them of his requirements. Such spaces and clearances shall, however, be kept to the minimum size required.

B. This Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include but not be limited to, valves, traps, clean-outs, motors, controllers, switch-gear, and drain points. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility.

C. This Contractor shall provide the access panels for concealed mechanical equipment, valves, controls, dampers, or other device requiring service. (Refer to paragraph 1.20 of this Section.)

1.19 FOUNDATIONS, SUPPORTS, PIERS, ATTACHMENTS

A. This Contractor shall furnish and install all necessary foundations, supports, pads, bases and piers required for all air conditioning equipment, piping, pumps, tanks, compressors, and for all other equipment furnished under this Division, and shall submit drawings to the Architect/Engineer for approval before purchase, fabrication or construction of same.

B. For pumps, compressors, and other rotating machinery, and for all equipment where foundations are indicated, provide concrete pads as shown. All pads shall be extended six inches (6") beyond machine base in all directions with top edge chamfered. Inset six inches (6") steel dowel rods into floors to anchor pads. Shop drawings of all foundations and pads shall be submitted to the Architect/Engineer for approval before same are constructed.

C. Construction of foundations, supports, pads, bases, and piers where mounted on the floor, shall be the same materials and same quality of finish as the adjacent and surrounding flooring material.

D. All equipment, unless shown otherwise, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and any attachments that are, in the opinion of the Architect/Engineer, not strong enough shall be replaced as directed.

1.20 ACCESS DOORS FOR WALLS AND CEILINGS

A. Provide flush panel access with a 16 gauge steel frame and a 14 gauge steel door panel.

B. Finish is to be primed painted steel.

C. Provide concealed hinges which allow the door to open 175 degrees and have a removable pin.

D. Provide access doors with a locked flush mounted vandal-proof spanner head operated steel cams.

E. Provide 1-1/2 hour "B" label door for rated chase walls.

F. Furnish masonry anchors for installation in masonry walls and metal lath wings with casing bead for plaster installation.

G. Provide a minimum 2'-0" x 2'-0" access doors unless shown or noted otherwise on the drawings.

H. Access doors for chase walls shall be mounted 16" off the finish floor.

I. Access doors for mechanical equipment shall be a minimum of 12" larger than equipment all around.

1.21 VALVE BOXES

A. All exterior underground valves shall be provided with exterior valve boxes equipped with removable covers appropriately labeled.

B. Valve boxes shall be manufactured of reinforced fiberglass plastic or heavy duty PVC as approved by the Architect/Engineer.

1.22 WELDING

A. Welded pipe joints shall be made by the oxyacetylene or electric process in accordance with the Code of Pressure Piping ASA B31.1.

B. Welding shall be done with good quality modern welding equipment, by competent operators, and in thorough, first class manner, conforming to AWS Standards.

C. The Contractor shall be required to furnish proof of the competency of each welding operator for both field and shop welds and shall, at the request of the

Architect/Engineer, have all or any of such welding operators pass a standard qualification test such as ASME, AWS, or Hartford Insurance Company procedure and tests.

D. Filler-metal for the welding process shall conform to ASTM A233 "Specification for Mild Steel Arc-Welding Electrodes". Classification of electrodes shall be one of the following: E6010, E6015, E7016, E7018.

E. When welding is to be performed, precautionary measures must be taken to prevent fire. Remove flammable materials and debris from the area. Provide an appropriate extinguisher nearby.

F. Pipes shall be cut short and cold sprung into place before welding or fabricating to compensate for expansion of lines when hot.

G. Welds shall be of the single vee butt type. Pipe end shall be shop beveled to 45 degrees to within 1/16 inch of the inside wall surface.

H. The abutting ends of the joints shall be separated before welding to permit complete fusion, tacked in two or more points to maintain alignment, and welded. Welding shall be continuous around the pipe.

I. Welds shall be of sound weld metal, thoroughly fused into the ends of the pipe and to the bottom of the vee, and shall be built up in excess of the pipe wall to give a reinforcement of one-quarter (1/4) the pipe wall thickness and in such a manner that one weld metal will present a gradual increase in thickness from the surface of the pipe to the center of the weld. The minimum width of the weld shall be 2-1/2 times the pipe wall thickness

J. The fillet welds from the flanges of fittings shall be fused into the pipe and plate for minimum distance of 1-1/2 times the pipe wall thickness and shall be built up to present a minimum throat thickness of depth of weld of 1-1/4 times the pipe wall thickness.

K. Branch connections shall be fabricated by welding. Openings cut into pipe for welded connections shall be accurately made to give carefully matched intersections and welding fittings shall be carefully welded into the pipe system.

L. Welding ells shall be used at all turns in welded pipe lines; no mitred ells will be approved.

M. Where branch piping is three times smaller than the main, branch connections shall be made up with the appropriate manufactured weld-on fitting. Welded tees shall be used for all other branch connections, unless otherwise approved by the

Architect/Engineer for a specific case.

1. Approved Manufacturers:

a) Allied Piping Products.
b) Bonney Forge.
c) Branch Connections.
d) Branchlets.
e) Tube Turn.
f) Thread-O-Lets.

N. Welds in piping shall be annealed after welding to remove the welding strains. The temperature need not exceed that causing a dull red, and shall be uniform around the pipe. Welds made in place shall be annealed, but the pipe shall be free to expand and shall be properly supported so as to avoid stresses. Annealing shall always be followed by slow cooling.

1.23 REGULATORY REQUIREMENTS

A. Conform to applicable Codes and Standards as follows:

1. Standard:

a) Certain standard materials and installation requirements are described by reference to standard specifications. These standards are as follows:

ASA	- American Standards Association.
ASTM	- American Society for Testing Materials.
ASME	- American Society of Mechanical Engineers Code of Unfired Pressure Vessels.
NEMA	- National Electrical Manufacturers Association.
UL	- Underwriters Laboratories.
ANSI	- American National Standards Institute.
ASHRAE	- American Society of Heating, Refrigerating and Air Conditioning Engineers.
SMACNA	- Sheet Metal and Air Conditioning Contractors National Association.
AMCA	- Air Moving and Conditioning Association.
ARI	- Air Conditioning and Refrigeration Institute.
AMA	- Acoustical Materials Association.

For additional standards and requirements see other sections of the specifications.

Whenever a reference is made to a standard, installation and materials shall comply with the latest published edition at the time project is bid unless otherwise specified herein.

2. Codes and Rules:

a) All material furnished and all work installed shall comply with the following codes as they apply to this project:

National Electric Code.
Regulations of the Florida Industrial Commission Concerning Safety.
Applicable County, State and Local Building Codes.
Local and State Fire Marshal Rules and Regulations.
Occupational Safety and Health Agency Standards (OSHA).
Florida State Board of Health Rules and Regulations.
Southern Standard Mechanical Code.
Florida Department of Education - 6A-2 Requirements.
Applicable codes shall be those adopted by the authority having jurisdiction at the time project is bid.

1.24 SCOPE OF WORK

A. The scope of the Work included under this Division of the Specifications shall include complete mechanical systems as shown on the plans and as specified herein. The General Conditions and Special Conditions of these specifications shall form a part and be included under this Section of the Specifications. Provide all supervision, labor, material, equipment, machinery, plant, and any and all other items necessary to complete the mechanical systems. All items of equipment are specified in the singular; however, provide and install the number of items of equipment as indicated on the drawings, and as required for complete systems.

B. Systems shall include all appurtenances as required to achieve the operating conditions as shown and specified and shall result in a superior installation.

C. Scope of Work shall include, but not be limited to, the following:

1. New Work:

a) Provide new split system air conditioning units complete with disconnects, piping, filters, controls, supports, drains, etc.
b) Provide air handling units complete with coils, filters, ductwork, insulation system, controls, etc.
c) Provide a new automatic temperature control system.

d) Insulate all new domestic hot water piping. Insulate all new equipment with exposed hot and cold surfaces.
e) Provide complete balancing of air systems.
f) Provide complete sanitary systems as shown on drawings. Provide a complete and operating condensate removal system for each new air handler installed.
g) Provide new domestic hot and cold water system as shown on drawings.
h) Provide new plumbing fixtures where indicated on drawings.
i) Provide exhaust air systems complete with ductwork as shown on the drawings.
j) Make all final connections of ductwork, piping to equipment and plumbing fixtures.

D. All electrical Work required to support mechanical equipment or is otherwise necessary to operate mechanical equipment, shall be responsibility of the Mechanical Contractor (including, but not limited to) electrical motors for all motor-operated equipment required under this Division, motor controllers, all starters not provided by the Electrical Contractor (coordinate with Electrical Contractor), pilot lights and relays, line and low voltage control wiring, raceways, connections to switches, and other electrical devices furnished with temperature control systems except as otherwise provided for in other Divisions of this Specification.

E. Mechanical contractor is required to coordinate and confirm with the electrical subcontractor prior to ordering any equipment, that the equipment specified is compatible, suitable and adequate with/for the electical systems.

F. Any equipment submitted for prior approval shall be submitted with the following written information specifically for the submitted project application: specific model numbers, dimensional data, performance data and other data as requested by the Architect/Engineer. General or ambiguous submittals will not be considered for prior approval.

1.25 PROJECT/SITE CONDITION

A. Install Work in locations shown on Drawings, unless prevented by Project conditions.

B. Prepare Drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other sections. Obtain permission of Owner/Engineer before proceeding.

1.26 TRENCHING AND BACKFILLING

A. For requirements for trenching and backfilling, refer to Division 2.

1.27 AS BUILT DRAWINGS

A. This Contractor shall provide as built drawings (SEPIAS) before final payment will be issued.

END OF SECTION 15010

SECTION 15140 - SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Pipe, duct and equipment hangers, supports, and associated anchors.

B. Equipment bases and supports.

C. Sleeves and seals.

D. Flashing and sealing equipment and pipe stacks.

1.02 RELATED WORK

A. Section 15010 - Basic Mechanical Requirements.

B. Section 15260 - Piping Insulation.

C. Section 15290 - Ductwork Insulation.

D. Section 15400 - Testing of Piping Systems.

E. Section 15410 - Plumbing Piping.

F. Section 15430 - Plumbing Specialties.

G. Section 15440 - Plumbing Fixtures.

H. Section 15450 - Plumbing Equipment.

I. Section 15890 - Ductwork.

J. Section 15910 - Ductwork Accessories.

K. Section 15936 - Air Outlets and Inlets.

L. Section 15990 - Testing, Adjusting, and Balancing.

1.03 SPECIAL REQUIREMENTS

A. Contractor shall submit shop drawings on products and methods of pipe supports.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. B-Line Systems.

B. Grinnel.

C. F and S.

2.02 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 2 Inch: Carbon steel, adjustable swivel, split ring (copper plated for copper pipe, dura green epoxy coating on non-copper pipe).

B. Hangers for Pipe Sizes 2 to 4 Inches and Cold Pipe Sizes 6 Inches and Over: Carbon steel, adjustable, clevis (copper plated for copper pipe, dura green epoxy coating on non-copper pipe).

C. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger (dura green epoxy coating).

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods; cast iron roll and stand for hot pipe sizes 6 inches and over.

E. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

F. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roll for hot pipe sizes 6 inches and over. Refer to drawings for special support details.

G. Vertical Support: Steel riser clamp (at each floor or 12'-0").

H. Floor Support for Pipe Sizes to 4 Inches and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.

I. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

J. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

K. Shield for Insulated Piping 2 Inches and Smaller: 18 gage galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.

L. Shield for Insulated Piping 2-1/2 Inches and Larger (Except Cold Water Piping): Pipe covering protective saddles.

M. Shields for Insulated Cold Water Piping 2-1/2 Inches and Larger: Hard block non-conducting saddles in 90 degree segments, 12 inch minimum length, block thickness same as insulation thickness.

N. Shields for Vertical Copper Pipe Risers: Sheet lead.

O. Refer to drawings for additional supports.

2.03 HANGER RODS

A. Hanger Rods: Threaded both ends, threaded one end, or continuous threaded. Hanger rods shall be zinc plated steel.

2.04 INSERTS

A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.05 FLASHING

A. Metal Flashing: 22 gage galvanized steel.

B. Lead Flashing: 5 lb./sq. ft. sheet lead for waterproofing; one lb./sq. ft. sheet lead for soundproofing.

C. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

2.06 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 18 gage galvanized steel.

B. Sleeves for Pipes Through Non-fire Rated Walls or Footings: Form with steel pipe or 18 gage galvanized steel.

C. Sleeves through outside walls, refer to drawings.

D. Sleeves for pipes through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated sleeves including seals, UL listed.

E. Sleeves for Round Ductwork: Form with galvanized steel.

F. Sleeves for Rectangular Ductwork: Form with galvanized steel.

G. Caulk: Silicone sealant of top quality.

2.07 FABRICATION

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe.

C. Provide copper plated hangers and supports for copper piping.

2.08 FINISH

A. Steel pipe hangers, steel supports, miscellaneous steel supports, bolts, screws, etc., not specified to be plated or coated shall be hot dipped galvanized with a minimum of 1.50 oz/ft^3 on all sides and all field cuts shall be zinc coated.

PART 3 - EXECUTION

3.01 INSERTS

A. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

B. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

C. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surfaces.

3.02 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

PIPE SIZE	MAX. HANGER SPACING	HANGER ROD DIAMETER
1/2 to 1-1/4 inch	6'-6"	3/8"
1-1/2 to 2 inch	10'-0"	3/8"
2-1/2 to 3 inch	10'-0"	1/2"
4 to 6 inch	10'-0"	5/8"
8 to 12 inch	14'-0"	7/8"
14 inch and Over	20'-0"	1"
PVC (All Sizes)	4'-0"	3/8"

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

C. Place a hanger within 12 inches of each horizontal elbow.

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. All auxiliary steel required for pipe supports shall be furnished and installed by this

Contractor. Where building structure is not usable for pipe supports, provide steel members, channels, angles, or "UNISTRUT" components for piping support. All auxiliary steel exposed to weather shall be galvanized.

J. Provide all steel required for support of pipes other than steel shown on structural Engineer's drawings.

3.03 EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases and supports of concrete type under all mechanical equipment and as shown on drawings.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct support of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

E. Refer to Section 15010, Article 1.19, Foundations, Supports, Piers, Attachments, for additional requirements.

3.04 FLASHING

A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counterflash and seal.

C. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed in accordance with Manufacturer's instructions for sound control.

3.05 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Extend sleeves through floors one inch above finished floor level. Caulk sleeves full

depth and provide floor plate.

C. Where piping penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk seal. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

D. Install chrome plated steel escutcheons at finished surfaces.

END OF SECTION 15140

SECTION 15260 - PIPING INSULATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Piping insulation.

B. Jackets and accessories.

1.02 RELATED WORK

A. Section 15010 - Basic Mechanical Requirements.

B. Section 15140 - Supports and Anchors.

C. Section 15290 - Ductwork Insulation.

D. Section 15400 - Testing of Piping Systems.

E. Section 15410 - Plumbing Piping.

F. Section 15430 - Plumbing Specialties.

G. Section 15440 - Plumbing Fixtures.

H. Section 15450 - Plumbing Equipment.

I. Section 15890 - Ductwork.

J. Section 15910 - Ductwork Accessories.

K. Section 15936 - Air Outlets and Inlets.

L. Section 15990 - Testing, Adjusting, and Balancing.

1.03 REFERENCES

A. ASTM C552-79 - Cellular Glass Block and Pipe Thermal Insulation.

B. ANSI/ASTM C195 - Mineral Fiber Thermal Insulation Cement.

C. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation.

D. ASTM B209 - Aluminum and Aluminum-alloy Sheet and Plate.

E. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.

F. ASTM E84, NFPA 255 and UL 723 - Surface Burning Characteristics of Building Materials.

1.04 QUALITY ASSURANCE

A. Applicator: Company specializing in piping insulation application with three (3) years minimum experience.

B. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, UL 723, and NFPA 255.

1.05 SUBMITTALS

A. Submit product data under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

B. Include product description, list of materials and thickness for each service, and locations.

C. Submit manufacturer's installation instructions.

PART 2 - PRODUCTS

2.01 INSULATION

A. Type A:

1. Impermeable, noncombustible, closed cellular glass insulation, conforming to ASTM C 552-79, "Specification for Cellular Glass Block and Pipe Thermal Insulation."
2. Conductivity (k) equals approximately 0.35 (BTU-IN/HR, SF, Degrees F) at

75 degrees F.

3. Joint sealants and coatings shall be as approved by the insulation manufacturer for the intended application and service temperature range.
4. Jacketing shall be approximately 125 mils thick, consisting of a bituminous resin reinforced with a woven, glass fabric, an integral aluminum foil layer, and a protective plastic film coating.

5. Approved Manufacturers and trade names:

   a. Pittsburgh Corning Corp. - "Foamglass" with Pittseal, Pittcote, and Pittwrap.
   b. Approved Equal.

B. Type B:

1. Closed cell, flexible foamed plastic conforming to ASTM C534, "Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form."
2. Conductivity (k) equals approximately 0.27 (BTU-IN/HR, SF, Degrees F) at 75 degrees F.
3. Approved Manufacturers and trade names:

   a. Armstrong - "Armaflex II".
   b. B.F. Goodrich - "Flexible Insulation Tubing and Sheeting".
   c. Manville Corp. - "Aerotube".

C. Type C:

1. Glass fiber, rigid molded sectional pipe covering conforming to ASTM C547, Class II, Mineral Fiber Preformed Pipe Insulation.
2. Conductivity (k) equals approximately 0.23 (BTU-IN/HR SF, Degrees F) at 75 degrees F.
3. Approved Manufacturers and trade names:

   a. Manville Corp. - "Micro-Lok 650-AP-T."
   b. Owens-Corning Fiberglass Corp. - "One Piece 25 ASJ/SSL-II".
   c. Certain-Teed - "500 Degree Snap-On."

2.02 JACKET

A. Interior Applications:

1. Vapor Barrier (ASJ) Jackets: Kraft reinforced foil vapor barrier with double self-sealing adhesive joints.

B. Exterior Applications: (Exterior and other exposed areas such as equipment/ mechanical rooms.)

1. Aluminum Jackets: ASTM B209; 0.016 inch thick; smooth finish.

2.03 ACCESSORIES

A. Insulation Bands: 3/4 inch wide; 0.0007 thick aluminum.

B. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

C. Insulation Bonding Adhesive (to metal):

1. Benjamin Foster 85-15
2. Chicago Mastic 17-460
3. Insul-Coustic IC 201

D. Insulating and Finishing Cement:

1. Forty-Eight Insulations, Inc.
2. Keene Corp.
3. Manville Corp.

E. Vapor Barrier Lap Adhesive:

1. Benjamin Foster 82-07
2. Chicago Mastic 17-465
3. Insul-Coustic IC 501

F. Vapor Seal Mastic:

1. Benjamin Foster 30-35
2. Chicago Mastic 17-475
3. Insul-Coustic IC 501

G. Lagging Adhesive:

1. Benjamin Foster 30-36
2. Chicago Mastic 16-400
3. Insul-Coustic IC 102

H. Glass Cloth Jacket:

1. Benjamin Foster
2. Chicago Mastic
3. Insul-Coustic

I. PVC Fittings Covers:

1. Certain-Teed - "Snap Form"
2. Manville Corp. - "Zeston"
3. Approved Equal

PART 3 - EXECUTION

3.01 PREPARATION

A. Install materials after piping has been tested, cleaned, and approved, as required by Section 15400.

B. All surfaces to be insulated shall be dry and free of loose scale, rust, dirt, oil or water.

3.02 APPLICATION

A. Insulation shall be installed in a smooth, clean, workmanlike manner. Joints shall be tight and finished smooth without fishmouths.

B. Insulation shall fit tightly against the surface to which it is applied to prevent air circulation between the insulation and the pipe or equipment to which it is applied.

C. Insulation applied to cold piping or equipment shall be completely vapor sealed, free of pin holes or other openings.

D. Do not use wet insulation materials.

E. All longitudinal joints on vertical pipe runs shall be staggered.

F. Apply insulation so as to permit expansion or contraction of pipe lines without causing damage to insulation or surface finish.

G. Do not apply mastic or adhesive until all previous application of mastic and adhesives have thoroughly dried.

H. The adhesive used in connection with all covering work shall contain an approved vermin and rodent-proof ingredient.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

3.04 TYPE A INSULATION INSTALLATION

A. Interior:

1. Butter joints of Foamglass insulation with Pittseal 444. Apply insulation to pipe and fittings with all joints tightly fitted. Secure with stainless steel wire so that each length of insulation shall be secured with two wires. Insulation shall be applied with all joints fitted to eliminate voids. Voids shall be eliminated by refitting or replacing insulation. Do not fill voids with joint sealer.
2. Finish with white Kraft or vinyl-foil laminate fire rated all service jacket, all joints and laps sealed with fire rated adhesive. Finish elbows and fittings with Pittcote 404 reinforced with white open weave membrane with maximum mesh opening of 10 x 10 per inch.

B. Exterior and Mechanical Equipment/Storage Rooms:

1. Apply insulation as noted above and finish with Pittcote 404 reinforced with white open weave membrane with maximum mesh opening of 10 x 10 per inch. Then apply a second coat of Pittcote 404 and finish with .016 aluminum jacket. Elbows shall be finished with preformed aluminum fitting covers.

3.05 TYPE B INSULATION INSTALLATION

A. Interior:

1. Type B insulation shall be slipped on the pipe prior to connection, and the butt joints shall be sealed. Where the slip-on technique is not possible, the insulation shall be carefully slit and applied to the pipe.
2. All joints shall be sealed with the Manufacturer's recommended adhesives.
3. Do not apply Type B insulation in multiple layers.
4. Type B insulation shall not be used in plenums nor fire wall penetrations.
5. This Contractor shall paint Type B insulation exterior to the building with two (2) coats of a vinyl lacquer paint recommended by the Insulation Manufacturer.

B. Exterior and Mechanical Equipment/Storage Rooms:

1. Type B insulation shall be installed as described for interior except the pipe and fitting shall be covered with .016 aluminum jacket.

3.06 TYPE C INSULATION INSTALLATION

A. Tightly butt together sections of insulation on pipe runs sealing longitudinal seams of jacket with vapor barrier adhesive. Seal end joints with four inch (4") wide straps of vapor barrier tape. Seal off ends of insulation with vapor seal mastic at valves, fittings, and flanges. No further finish required.

B. PVC fitting jackets shall be used when they are available for the particular application.

3.07 HANGERS

A. Continue insulation through pipe hangers. Provide either rigid insulation inserts or sheet metal inserts at all outside pipe hangers. Provide rigid insulation inserts for piping operating below 60 degrees F and sheet metal inserts for piping above 60 degrees F.

B. Rigid insulation or wood inserts between the pipe and pipe hanger shall be of a thickness equal to the adjoining insulation and shall be provided with vapor barrier where required. Insulation insert shall not be less than the following lengths:

1/2" to 1-1/2" pipe size	10" Long
3" to 6" pipe size	12" Long
8" to 10" pipe size	16" Long
12" and Over	22" Long

C. Inserts for cold piping shall have a vapor barrier facing of the same material as the adjacent pipe insulation. Seal inserts into insulation with vapor seal mastic.

D. Where insulation is a load bearing material of sufficient strength to support the weight of the piping, pipe shields one-third the circumference of the insulation and of a length not less than three times the diameter of the insulation (maximum length 24") shall be provided. An all service jacket shall be applied between shields and insulation. Follow insulation manufacturer's recommendations for use of pipe insulation in conjunction with outside installed hangers.

E. Where insulation is not of sufficient strength to support the weight of the piping, a saddle or section of calcium silicate insulation such as "Kaylo" shall be provided. Vapor barrier and finish shall be applied as required to match adjoining insulation. In addition, shields shall be furnished as specified above.

3.08 PIPE SLEEVES

A. Pipe insulation and vapor barrier shall be continuous through sleeves in walls and floors.

B. Type B insulation shall not be used in sleeves through fire walls or fire rated (2 hour) floor systems. Use Type A or Type C through the sleeve instead of vapor seal the joint between the two (2) insulations.

C. Provide 26 gauge galvanized steel or 0.020 inch aluminum jacket over insulation on pipe passing through sleeves where sealant is required.

D. Where penetrating interior walls, extend the metal jacket 2 inches out either side of the wall and secure each end with a metal band compressing the insulation slightly.

E. Where penetrating floors, extend the metal jacket 2 inches below the floor and 5 inches above the floor. Secure with metal bands.

3.09 INSULATION SCHEDULE (ABOVE GRADE PIPING)

A.

SERVICE	PIPE SIZE	INSULATION TYPE AND THICKNESS
Domestic Cold Water	2" or Less, Okay	1-1/2" Type A

A.

SERVICE	PIPE SIZE	INSULATION TYPE AND THICKNESS
Coil Condensate Lines(except in plenums or fire wall penetrations)	All	3/4" Type B
Coil Condensate Lines (In plenums or fire wall or floor penetrations)	1-1/4" or Less	3/4" Type A
Heating Hot Water	3-1/2" or Less	1-1/2" Type A
Heating Hot Water	4" or More	2" Type A

SERVICE	PIPE SIZE	INSULATION TYPE AND THICKNESS
Domestic Cold Water, Tempered Water, Recirculated Hot Water, and Service Hot Water	2-1/2" or More	1-1/2" Type C
Roof Drain Bodies	All	1" Type A
Horizontal Rain Water Conductors	All	1" Type A

END OF SECTION 15260

SECTION 15290 - DUCTWORK INSULATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Ductwork insulation.

1.02 RELATED WORK

A. Section 15010 - Basic Mechanical Requirements.

B. Section 15140 - Supports and Anchors.

C. Section 15260 - Pipework Insulation.

D. Section 15400 - Testing of Piping Systems.

E. Section 15410 - Plumbing Piping.

F. Section 15430 - Plumbing Specialties.

G. Section 15440 - Plumbing Fixtures.

H. Section 15450 - Plumbing Equipment.

I. Section 15890 - Ductwork.

J. Section 15910 - Ductwork Accessories.

K. Section 15936 - Air Outlets and Inlets.

L. Section 15990 - Testing, Adjusting, and Balancing.

1.03 REFERENCES

A. ANSI/ASTM C553 - Mineral Fiber Blanket and Felt Insulation.

B. ANSI/ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

1.04 QUALITY ASSURANCE

A. Applicator: Company specializing in ductwork insulation application with two (2) years minimum experience.

B. Materials: UL listed; flame spread/smoke developed rating of 25/50 in accordance with NFPA 90A.

1.05 SUBMITTALS

A. Submit product data under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

B. Include product description, list of materials and thickness for each service, and locations.

C. Submit manufacturer's installation instructions.

D. Submit product description and manufacturer's instructions for all adhesives, mechanical fasteners, joint tape, etc., prior to starting work.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Knauf Fiberglass.

B. Owens Corning Fiberglass.

C. Mansville.

D. Pre-approved Equal.

2.02 MATERIALS

A. Type A: Flexible glass fiber; ANSI/ASTM C553; commercial grade; 1.5 PCF 'R' value of 5.8 (out of package), 4.4 installed 'R' value (minimum) at 75 degrees F, .002 foil scrim facing for air conditioning ducts (1.5" thick).

B. Adhesives: Waterproof fire-retardant type and conform to adhesive and sealant council standards; ASC-A7001A-1971.

C. Lagging Adhesive: Fire resistive to ASTM E84. NFPA 255. UL 723.

D. Mechanical Fasteners: Galvanized steel, 12 gage, self-adhesive pad. Fasteners shall conform to mechanical fastener standard MF-1-1971 (available from SMACNA).

E. Joint Tape: Glass fiber cloth, open mesh.

F. Tie Wire: Annealed steel, 16 gage.

PART 3 - EXECUTION

3.01 PREPARATION

A. Install materials after ductwork has been tested and approved.

B. Clean surfaces for adhesives.

C. Extend shafts for handles on equipment/devices which are insulated so that insulation is applied at the intended thickness (not compressed). Insulation shall be installed in a manner to eliminate sweating on handles and shafts. Handles shall remain accessible, visible and operable.

3.02 INSTALLATION

A. Type A:

1. Apply insulation tightly and smoothly to duct.
2. Secure insulation on the bottom of ducts and plenums and on the sides of plenums and other places where the insulation will sag.
3. Install all materials in accordance with Manufacturer's installation instructions.
4. Butt all insulation joints firmly.
5. Install duct wrap to obtain specified 'R' value using a maximum of 25% compression.
6. All penetrations and damage to the facing shall be repaired with tape or mastic prior to system start-up.

7. Provide 3" wide (minimum) pressure sensitive tape applied with moving pressure using an appropriate sealing tool at all seams and joints.
8. Longitudinal seam of the vapor retarder shall be overlapped a minimum of 2 inches. A 2 inch tab shall be provided for the circumferential seam.
9. Closure systems shall have a 25/50 flame spread/smoke developed rating per UL 723.
10. For rectangular ducts over 18 inches wide, the duct wrap shall be secured to the bottom side of the duct with mechanical fasteners spaced on 18 inch centers to reduce sag. Fasteners shall be installed in a manner to avoid over compressing the insulation with the retaining washer.

B. Install all materials in accordance with Manufacturer's installation.

C. Refer to Section 15890 for weather proofing of outdoor ductwork.

D. Continue insulation with vapor barrier through penetrations.

3.03 SCHEDULE

A. Supply and Return Ductwork - Type A (1-1/2" thick).

B. Flex Connections at Air Handling Units and Other Transitions - Type A (1-1/2" thick).

C. All Equipment and Ductwork Operating Below Ambient Dew Point - Type A (1-1/2" thick).

D. Tops of All Supply Diffuser - Type A (1-1/2" thick).

END OF SECTION 15290

SECTION 15300 - FIRE PROTECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 The work performed under this Section shall be by a State of Florida certified fire protection contractor with a minimum of 5 years experience.

1.03 This section shall govern the furnishing of all labor, equipment, materials and services necessary to install complete operating wet sprinkler systems, fire pump, in strict accordance with NFPA 13 and 24 and all applicable specifications.

1.04 All threads shall be in accordance with local fire department specifications.

1.05 Standards: All equipment and devices shall be U.L./F.M. approved.

1.06 Scope:

A. Work includes, but is not necessarily limited to the following:

1. Automatic sprinkler systems, (1) free standing fire department connection and fire hydrant with supply underground mains, underground mains, any and all accessories as shown on drawings or as required by the Florida Statutes, Chapter 633, Florida Administrative Code Chapter 69A, Florida Fire Prevention Code Chapter 69A-60, NFPA 1, Uniform Fire Code, Florida Edition, local fire department and NFPA13, 24, 25 and NPFA 101 Life Safety Code, Florida Edition, or Architect/Engineer.
2. Contractor shall visit site to check all existing conditions prior to bidding.
3. Not less than six (6) sets dated, signed shop drawings and hydraulic calculations along with one (1) set fire protection drawings and calculations shall be submitted to the local fire department planning office for stamped approval. The approved copies are then to be submitted to Architect and Engineer for approval prior to commencing any construction.
4. Material submittals shall be submitted to Architect/Engineer on all fire protection items and/or equipment for approval and shall be approved before any installation.

5. Tests, shall be conducted pursuant to NFPA 13, 24 and 25.
6. Inspection and final approval shall be by local Fire Department and Architect/Engineer.
7. Obtain all applicable permits and adhere to all governmental requirements.
8. Backfill and compaction to normal grade will be by this Contractor. Contractor to verify water tables and be responsible for de-watering if required.

1.07 Auxiliaries and Accessories: Include all auxiliaries and accessories for complete and properly operating systems.

1.08 Coordination: Provide all required coordination and supervision where work connects to or is affected by work of other trade.

1.09 Layout of Work: Correlate final equipment location with governing Architectural and Structural drawings. Lay out work before installation so that all trades may install equipment in spaces available. Provide coordination as required for installation in a neat and workmanlike manner.

1.10 Provisions for Openings: Locate all openings required for work performed under this section. Provide approved fire rated black steel Schedule 40 sleeves to allow passage of items installed under this section.

1.11 Supervision of the Work: Provide a field superintendent who has had previous successful experience on projects of comparable size and complexity. Superintendent shall be present at all times that work is being installed. Submit the proposed superintendent's experience qualifications for Architect/Engineer's review.

1.12 Protection and Clean-Up: Suitably protect all equipment furnished under this Division during construction. All rubbish occasioned by this installation shall be periodically removed from the premises and all exposed work shall be thoroughly cleaned prior to final acceptance. Restore any damaged surfaces and items to "like new" condition before a request for final acceptance.

1.13 Reports on Progress of Work Memo: Items noted during construction and before final acceptance which do not comply with the Contract Documents will be listed in a "Report on Progress of Work Memo" which will be sent to the Contractor for action. The Contractor shall have these items corrected, and shall sign and enter the date on which the item was corrected on two copies of the memo as indication that the item was corrected, and return the signed memos so items can be rechecked. Failure to return the signed memos shall be cause for disallowing monthly request for payments. Items noted after acceptance during one year guarantee period shall be checked by the Contractor in the same manner as above and signed memos returned by him when the items have been corrected.

1.14 Progress and Record Drawings: Keep two sets of white prints on the job. Neatly mark up design drawings with colored pencils each day as components (incorporate any/all changes to original design) are installed. Different colored pencils shall be used for different systems. Cost of prints shall be included under this Division. At the end of the project, all changes shall be transferred to a set of sepias of the design drawings to be forwarded to Engineer.

Cost of the sepias and of the drafting involved shall be included under this Division.

1.15 Until system is completed, tested and accepted, this Contractor shall be responsible for repair of leaks, and accidental breaks.

1.16 Contractor shall instruct Owner's designated employee in the proper operation and maintenance all fire protection systems and/or equipment. Contractor will also furnish Owner with two (2) sets of typed operating instructions in hard cover - 3-ring binders.

1.17 Performance Verification: Operate systems as required to demonstrate that the systems are operating correctly in accordance with the design, (this is to include line pressure testing). Supply instruments required to read data. Adjust systems to operate at the required performance levels. Advise Engineer 3 working days in advance of the time that the work will be done. Tabulate data for submission. Submit tabulated data on 8-1/2" x 11" sheets with data, time and name of checker with one copy for each technical information brochure. Data shall be submitted and approved before Check-out Memos are signed or a request for final inspection is made.

1.18 Guarantee: Contractor shall guarantee in writing, his responsibility for defective materials and workmanship for a period of one (1) year from date of Final Acceptance issued by the Architect and correct any deficiencies, labor and material, without additional cost to Owner.

1.19 Instruction to Owner: Submit all required items for checking one week before final inspection of the building is scheduled. When all items are approved and placed in the proper brochures, the Contractor shall give notice in writing that he is ready to give the Owner an "Instruction in Operation Conference". After the above mentioned request is received, the Contractor will be notified of the time the conference can be held with the Owner. At the conference, the Contractor shall review with the Owner all appropriate information. At the end of the conference, a copy of an Instruction in Operation Conference Memo shall be signed by the Contractor, Subcontractor and Owner, copy inserted in each brochure and one copy forwarded to the Engineer.

1.20 Time Schedule for Final Inspection of System: All work on the System shall be complete and all forms and other information shall have been submitted and approved before the request for a substantial completion inspection is made.

1.21 Roughing-in for equipment by others: Rough in all equipment requiring connections to systems furnished by this division and by others. Verify requirements and correct locations before proceeding with work.

1.22 Technical Information Brochure: Submit before start of construction or within ten days after award of the Contract.

A. Each brochure shall consist of an adequately sized, hard-cover, 3-ring binder for 8-1/2" x 11" sheets. Provide correct designation on outside cover and on end of brochure.

PART 2 - MATERIALS AND METHODS

2.01 Pipe shall be new, designed for 175 PSI working pressure, conforming to ASTM specifications, and have the manufacturer's name or brand, along with the applicable ASTM standard, marked on each length of pipe.

2.02 2" or smaller pipe shall be steel, Schedule 40, black, and in accordance with specifications ASTM A120 or A53.

2.03 2-1/2" or larger pipe shall be steel, Schedule 10, black, and in accordance with specification ASTM A135.

2.04 Schedule 40 black steel pipe shall be joined by screwed joints in accordance with specification ANSI B2.1.

2.05 Schedule 10 black steel ASTM A135 sprinkler pipe shall be joined by UL and FM approved mechanical couplings. Couplings may be of the rolled groove type or the mechanical locking type (push-on). Grooves for the rolled groove type shall be rolled only (die cut grooving will not be permitted) and they shall be dimensionally compatible with the coupling.

2.06 All black steel pipe must be preoxidized with a suitable protective coating. All pipe and valving shall be installed rust-free.

2.07 All ASTM A53 and ASTM A120 sprinkler pipe must be hydrostatic tested at the mill pursuant to the ASTM standard.

2.08 All ASTM A135 sprinkler pipe must be tested with a non-destructive electric test for continuous and uninterrupted inspection of the welded seam.

2.09 Screwed fittings shall be cast iron, 125 lb. class, black, and in accordance with ANSI B16.4 or malleable iron, 150 lb. class, black, and in accordance with ANSI B16.3.

2.10 Flanged fittings shall be threaded, cast iron, short body, Class 125, black, and in accordance with ANSI B16.1. Gaskets shall be full face of 1/8" minimum thickness red sheet rubber. Flange bolts shall be hexagon head machine bolts with heavy semi- finished hexagon head nuts, cadmium plated, having dimensions in accordance with ANSI B18.2. Grooved flanges shall not be permitted.

2.11 Welded branch connections shall be steel; standard weight, black, in accordance with AWSD10.9 and ANSI B31.1. Weld branch connections to main shall be permitted when pipe size of the branch line is more than (2) two nominal pipe sizes smaller than main.

2.12 Grooved couplings and mechanical fittings shall be malleable iron, 500 PSI working pressure, in accordance with ASTM A47. Coupling gasket material shall be butyl rubber. Grooved couplings and mechanical fittings shall be tested and listed by UL and/or FM. Style of grooved coupling/fittings shall be Victaulic. Grooved mechanical fittings such as; mechanical tees, roust-a-bout, plain end fitting, hookers, etc. shall not be used unless written permission from Engineer is obtained prior to any submissions or installation.

2.13 Underground piping shall be UL-FM approved, ductile iron, water pipe Class #52. Fittings shall be Class 250, Mechanical Joints. Install in strict accordance with NFPA 24. All underground bends shall be rodded and thrust blocked. All pipe shall be installed rust-free.

2.14 Corrosion Protection: Supply pipes, risers, branch lines, fittings, hangers, sprinkler, or any/all fire protection materials that are installed where corrosive conditions exist, or moisture may be present. The contractor shall provide protective coating that resists corrosion ie. galvanization. Galvanized painting shall not be permitted.

2.15 Automatic sprinkler heads shall have temperature ratings of fusible elements to be in accordance with NFPA -13.

2.16 Furnish spare sprinkler heads of each type, with wrench, in wall mounted cabinet. As required by NFPA 13.

2.17 See drawings for sprinkler types and locations and/or Architect or Engineer.

2.18 Contractor shall coordinate sprinkler spacing with all other trades as required.

2.19 Hangers: Methods of hanging pipes, headers and branches shall be approved by NFPA No. 13. All hangers on 4" pipe and larger is to be Clevis type hangers. Powder driven studs shall not be permitted. All hangers shall be U.L./F.M. approved.

2.20 Tests: Hydrostatic tests shall be conducted in accordance with the "National Fire Codes." Tests must be witnessed by Owner's representative.

2.21 Codes: Wherever, or whenever questions may arise, approval and directions shall be guided by the "National Fire Codes" and/or Architect-Engineer.

2.22 All wet-pipe system pipe sizes have been hydraulically proven and classified in strict accordance to NFPA 13.

2.23 Fire extinguishers shall be provided under other divisions of this specification.

2.24 Furnish and install (1) alarm check valve with variable pressure trim and water motor alarm - see drawings for detail size and locations. Style of valve, trim, water motor alarm, shall be Gem F200 valve/variable pressure trim/F630 water motor alarm or Viking G-1 valve/variable pressure trim/E-1 water motor alarm or equal.

2.25 Furnish and install (1) 2-1/2" X 2-1/2" X 6" recessed fire department connection with chrome finish - see drawings for location. Style of F.D.C. shall be Allenco #283 or Elkhart #165.

2.26 Provide and install post indicator valves. See drawings for detail, size and locations. Style of post indicator valves shall be Mueller Adjustable #G-1 or Stockham #G-951.

2.27 Electric Waterflow Devices and Supervisory Switches:

A. Furnish devices for installation of electrical flow and valve supervisory switches, whose function is to respond to flow in the sprinkler system and to sound an alarm if any system valve is closed.

B. Waterflow detector device shall have built-in pneumatic retard device with automatic reset dial and two snap-action SPDT switches (U.L./F.M. approved).

C. Style flow switches shall be Gem Model #WFD.

2.28 Fire Protection Contractor shall coordinate with Electrical Contractor to insure all fire protection electrical items have been properly completed.

2.29 Electrical switches shall be furnished and installed under this Division and wired under Division 16.

2.30 Gate valves for fire service shall be approved by the Underwriters' Laboratories, Inc., and the Factory Mutual Laboratories. Valves shall be factory marked "UL" and "FM", 175 PSI working pressure. Gate valves 2-1/2" or larger shall be flanged O.S. & Y. type. Butterfly valves shall not be used.

2.31 Check valves for fire service shall be approved by the Underwriters' Laboratories, Inc., and the Factory Mutual Laboratories. Valves shall be factory marked "UL" and "FM", 175 PSI working pressure. Spring loaded wafer check valves shall be used aboveground.

2.33 Furnish and install fire hydrants with gate valves and underground mains. See drawings for locations and detail for arrangement. Style of hydrants shall be Dresse M & H Standard Style #29 or Mueller Centurian (NST).

2.34 Furnish and install 2-1/2" fire department hose valves with U.L./F.M. 2-1/2" X 1-1/2" reducer, cap and chain. See drawings for locations. Style of valves shall be Allenco #170U or Elkhart #U-25.

2.35 Furnish and install fire hose and extinguisher cabinets contents to include; 2-1/2 inch fire hose valve, 2-1/2 inch by 1-1/2 inch reducers, 2-1/2 inch by 1-1/2 inch hose rack, 2-1/2 inch rack nipple, 1-1/2 inch pin lug coupling, 100 feet of 1-1/2 inch lined hose, adjustable fog nozzle and 10 lb. ABC fire extinguisher. See drawing for locations. Style of cabinets and contents shall be

Potter-Roemer; 2-1/2 inch valve #4075, 2-1/2 inch by 1-1/2 inch hose rack #2962, 2-1/2 inch rack nipple #2756, 2-1/2 inch by 1-1/2 inch reducer #2810, fire hose #2915, 1-1/2 inch pin lug coupling #2930, fog nozzle #2985, cabinet #1414 with breakglass and lock and fire extinguisher #3010; or Elkhart; 2-1/2 inch valve #U-20, 2-1/2 inch by 1-1/2 inch hose rack #S-41, 2-1/2 inch rack nipple #46-S, 2-1/2 inch by 1-1/2 inch reducer #335, fire hose #Super Elk-lite, 1-1/2 inch male coupling #335, fog nozzle #L-205-B, Larsen cabinet #HC3238R-flat with breakglass and lock, and fire extinguisher 10 lb. ABC.

2.36 Furnish and install backflow preventor - see drawings for location. Backflow preventer shall include backflow preventor and (2) O.S. & Y's factory assembled and shipped as one unit.

2.37 Furnish and install 2-1/2" hose valves for fire pump test header. Style of valves shall be Allenco #170U or Elkhart #U-25.

2.38 Furnish and install 10" electric bell(s) 24 DC. Style of electric bells shall be Notifier N-CO-Bell. See drawings for locations.

PART 3 - INSTALLATION

3.01 General: All materials, equipment and accessories shall be installed in accordance with NFPA Standard No. 13, 20 and 24.

3.02 All pipe hangers shall be securely anchored to the building structural components and shall be listed and approved by UL-FM, and Architect/Engineer. (Powder driven anchors are not permissible.).

3.03 The entire system shall be flushed with clean water to remove debris resulting from installation.

3.04 All required grouting shall be with non-shrink grout.

PART 4 - TESTING

4.01 ACCEPTANCE TESTS

A. Underground mains and lead-in connections to system risers shall be flushed before connection is made to sprinkler piping in order to remove foreign materials which may have entered the underground piping during the course of the installation. For all systems, the flushing operation shall be continued until water is clear.

B. Underground mains and lead-in connections shall be flushed at a flow rate not less than at the hydraulically calculated water demand rate of the system, whichever is greater.

C. Provision shall be made for the disposal of water issuing from test outlets to avoid property damage.

4.02 HYDROSTATIC TESTS

A. Systems including yard piping shall be hydrostatically tested at not less than 200 psi pressure for 2 hours, or at 50 psi in excess of the maximum pressure, when the maximum pressure to be maintained in the system is in excess of 150 psi.

B. The test pressure shall be read from a gage located at the low elevation point of the individual system or portion of the system being tested.

C. The inside sprinkler piping shall be installed in such a manner that there will be no visible leakage when the system is subjected to the hydrostatic pressure test.

D. Piping between the check valve in the fire department inlet pipe and the outside

connection shall be tested the same as the balance of the system.

E. Whenever a test blank is used it shall be of the self-indicating type. Test blanks shall have red painted lugs protruding beyond the flange in such a way as to clearly indicate their presence. The Contractor shall have all test blanks numbered so as to keep track of their use and assure their removal after the work is completed.

F. Approval of Sprinkler Systems:

1. The Contractor shall perform all required acceptance tests in accordance with NFPA 13, 20 and 24. Complete the Contractor's Material and Test Certificate(s), and forward the fire department approved certificate(s) to the Architect/Engineer for approval of the installation.
2. All test certificate(s) shall be dated, signed and witnessed by the local fire department and/or other authority having jurisdiction. Submit one copy of each test certificate to Architect/Engineer.

END OF SECTION 15300

SECTION 15400 - TESTING OF PIPING SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Domestic Water Piping.

B. Sanitary Piping.

1.02 RELATED WORK

A. Section 15010 - Basic Mechanical Requirements.

B. Section 15140 - Supports and Anchors.

C. Section 15260 - Pipework Insulation.

D. Section 15290 - Ductwork Insulation.

E. Section 15410 - Plumbing Piping.

F. Section 15430 - Plumbing Specialties.

G. Section 15440 - Plumbing Fixtures.

H. Section 15450 - Plumbing Equipment.

I. Section 15890 - Ductwork.

J. Section 15910 - Ductwork Accessories.

K. Section 15936 - Air Outlets and Inlets.

L. Section 15990 - Testing, Adjusting, and Balancing.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 INSTALLATION

A. Furnish all labor, materials, and equipment required for testing procedures.

B. Insulation shall not be applied until pressure testing has been completed. Joints of any type shall not be painted or varnished prior to testing.

C. Lines containing check valves shall have the test pressure source located upstream of the valves, or the valve discs shall be removed until after the testing. Control valves shall be set in the open position, unless directed otherwise.

D. Pipe testing shall be performed after flushing, except for buried lines.

E. Any equipment that has a pressure rating not as high as the testing pressure shall be valved off during the test.

F. The tabulated results of all tests shall be submitted to the A/E.

G. Potable hot and cold water lines shall be hydrostatically tested at 125 psi for a period of twenty-four (24) hours.

H. Soil waste, vent, and roof drain water lines shall be filled with water to the top of the system. Testing period shall be for a period of twenty-four (24) hours. Pipes shall be for a period of twenty-four (24) hours. Pipes or joints which leak shall be taken apart, remade, and re-tested.

I. Piping Systems: Test all pipe lines installed with a water pressure test of 1-1/2 times its operating pressure, but not less than 100 psi for a period of 4 hours, during which time the pressure shall remain constant without pumping. If leaks or defects develop, new tests shall be made and repeated until all defects are remedied. Pipes or joints which leak shall be taken apart and remade. Caulking will not be permitted. Pipes which will be concealed may be tested separately before the distribution system is installed in order that these lines may be covered and furred in and thus, not delay the work of other trades.

END OF SECTION 15400

SECTION 15410 - PLUMBING PIPING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Pipe and pipe fittings.

B. Valves.

C. Sanitary sewer piping system.

D. Domestic water piping system

1.02 RELATED WORK

A. Division 2 - Excavation.

B. Division 2 - Backfilling.

C. Division 2 - Trenching.

D. Section 15010 - Basic Mechanical Requirements.

E. Section 15140 - Supports and Anchors.

F. Section 15260 - Piping Insulation.

G. Section 15400 - Testing of Piping Systems.

H. Section 15430 - Plumbing Specialties.

I. Section 15440 - Plumbing Fixtures.

1.03 REFERENCES

A. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.

B. ANSI/ASTM B32 - Solder Metal.

C. ASTM A74 - Cast Iron Soil Pipe and Fittings.

D. ASTM A-518 - Acid Resistant Close Grained Cast Iron.

E. ASTM B88 - Seamless Copper Water Tube.

F. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

G. AWWA C601 - Standard Methods for the Examination of Water and Waste Water.

1.04 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

1.05 SUBMITTALS

A. Submit product data under provisions of General Conditions and supplementary General Conditions.

B. Include data on pipe materials, pipe fittings, valves and accessories.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect at products site under provisions of General Conditions and supplementary General Conditions.

B. Deliver and store valves in shipping containers with labeling in place.

PART 2 -PRODUCTS

2.01 SANITARY SEWER AND RAIN WATER PIPING, BURIED

A. Cast Iron Pipe: ASTM A74 service weight. Fittings: Cast iron. Joints: Hubs and spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.

B. Copper Tubing: ASTM B306, DWV. Fittings: ANSI/ASME B16.3, cast bronze, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 50B.

2.02 SANITARY SEWER AND RAIN WATER PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74 service weight. Fittings: Cast iron. Joints: Hubs and spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.

B. Copper Pipe: ASTM B306, DWV. Fittings: ANSI/ASME B16.3, cast bronze, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 50B.

C. DWV, PVC, Schedule 40 pipe may be used for circuit vents and revents (except in plenums or fire wall penetrations).

2.03 COLD WATER PIPING, BELOW GRADE (OUTSIDE BUILDING)

A. Copper tubing: ASTM B88, Type K, hard drawn. Fittings: ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B52, solder, Grade 95TA.

2.04 COLD WATER PIPING, BELOW FLOOR (INSIDE BUILDING)

A. Copper Tubing: ASTM B88, Type K, continuous tubing.

B. Fittings 5 feet outside of building shall be ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32 solder, Grade 95TA.

C. Fittings are not permitted below floor. Fittings at equipment shall be compression type.

D. Cast Iron Pipe: ANSI/AWWA C151. Fittings: Ductile iron, standard thickness. Joints: ANSI/AWWA C111, rubber basket with 3/4 inch diameter rods.

2.05 COLD WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type L hard drawn. Fittings: ANSI/ASME B16.23, cast brass, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.

2.06 INSULATION

A. Refer to Section 15260.

2.07 VALVES - GENERAL

A. Materials for all valves shall be bronze.

2.08 ACCEPTABLE MANUFACTURERS - GENERAL

A. Crane, Stockham, Jenkins, Nibco, Milwaukee.

2.09 GATE VALVES

A. Up to two (2) Inches: Bronze body, non-rising stem and handwheel, inside screw, single edge or disc, solder ends. Valves 2-1/2" through 4" shall be iron body bronze mounted with ends to suite pipe and shall be of non-rising stem type. Valves larger than 4" shall be iron body bronze mounted flanged ends with outside screw and yoke with rising stem. Working pressure for bronze valves shall be 150 pounds and iron valves 125 pounds per square inch.

2.10 GLOBE VALVES

A. Up to Two (2) Inches: Bronze body, rising stem and handwheel, inside screw, renewable composition disc, solder ends, with backseating capacity. Valves 2-1/2" and larger shall be iron body bronze mounted with ends to suit pipe, yoke bonnet, and disc guide. Working pressure for bronze valves shall be 150 psi and iron valves 125 psi.

2.11 BALL VALVES

A. Up to Two (2) Inches: Bronze body, stainless steel ball, teflon seats and stuffing box ring, lever handle and balancing stops, solder ends.

2.12 SWING CHECK VALVES

A. Up to Two (2) Inches: Bronze 45 degree swing disc, solder ends. Valves 2- 1/2" and larger shall be iron body brass mounted and with ends to suit pipe. Working pressure for check valves shall be 125 pounds.

2.13 WATER PRESSURE REDUCING VALVES

A. Up to Two (2) Inches: Bronze body, stainless steel and thermoplastic internal parts,

fabric reinforced diaphragm, strainer, and single union.

PART 3 - EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt on inside and out before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

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

B. Route piping in orderly manner and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations.

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

F. Provide clearance for installation of insulation and access to valves and fittings.

G. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with General Contractor.

H. Slope water piping and arrange to drain at low points.

I. Establish elevations of buried piping outside the building to ensure not less than three (3) feet of cover, or as existing piping connections require.

J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

K. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting. Refer to Section 09900.

L. Copper piping installed below grade shall be coated with two (2) coats of bituminous material.

M. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.

N. Excavate in accordance with Sections on Excavation and Backfill.

O. Install bell and spigot pipe with bell end upstream.

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

Q. Install silicon iron waste and vent pipe in accordance with manufacturer's recommendations.

3.03 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.

D. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Install globe valves for throttling, bypass, or manual flow control services.

3.04 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting Work, verify system is complete, flushed and clean.

B. Ensure PH of water to be treated is between 7.4 and 7.6 by adding alkali or acid.

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water.

H. Take samples no sooner than twenty-four (24) hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C601. Contractor is responsible for all costs associated with this testing. Supply Engineer with written results from a certified testing laboratory once testing is complete.

END OF SECTION 15410

SECTION 15430 - PLUMBING SPECIALTIES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Floor drains.

B. Cleanouts.

C. Backflow Preventors

D. Dielectric Fittings.

E. Hose Bibbs/Wall Hydrants.

F. Thermometers.

G. Shock Absorbers.

H. Vent Flashing.

I. Trap Primers.

J. Water Control Box.

K. Escutcheons.

L. Water Pressure Reducing Valves.

M. T&P Relief Valves.

1.02 RELATED WORK

A. Section 15010 - Basic Mechanical Requirements.

B. Section 15140 - Supports and Anchors.

C. Section 15260 - Pipework Insulation.

D. Section 15290 - Ductwork Insulation.

E. Section 15400 - Testing of Piping Systems.

F. Section 15410 - Plumbing Piping.

G. Section 15440 - Plumbing Fixtures.

H. Section 15450 - Plumbing Equipment.

I. Section 15890 - Ductwork.

J. Section 15910 - Ductwork Accessories.

K. Section 15936 - Air Outlets and Inlets.

L. Section 15990 - Testing, Adjusting, and Balancing.

1.03 REFERENCES

A. ANSI/ASSE 1011 - Hose Connection Vacuum Breakers.

B. ANSI/ASSE 1019 - Wall Hydrants.

C. ANSI A112.21.1 - Floor Drains.

D. ANSI A112.26.1 - Water Hammer Arrestors.

E. PDI WH-201 Water Hammer Arrestors.

1.04 QUALITY ASSURANCE

A. Manufacturer: For each product specified, provide components by same manufacturer throughout, or as noted.

1.05 SUBMITTALS

A. Submit shop drawings and product data under Section 15010, General Conditions and Supplementary General Conditions.

B. Include component sizes, rough-in requirements, service sizes, and finishes.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - FLOOR DRAINS

A. Zurn Industries, Inc.

B. Josam Manufacturing.

C. Wade Division / Tyler Pipe.

2.02 FLOOR DRAINS

A. Refer to schedule on drawings.

B. Josam Manufacturing.

C. J.R. Smith.

2.03 ACCEPTABLE MANUFACTURERS - CLEANOUTS

A. Zurn Industries, Inc.

B. Josam Manufacturing.

C. J.R. Smith.

2.04 CLEANOUTS

A. Wall Cleanout (WCO): Cast Iron Perrule and Cadmium plated Cast Iron counter sunk plug complete with round stainless steel access cover with securing screw.

B. Floor Cleanout (CO): Cast Iron Cleanout with round, heavy duty scoriated secured top with carpet retainer and adjustable to finished floor.

C. Refer to schedule on drawings.

2.05 ACCEPTABLE MANUFACTURERS - SHOCK ARRESTORS

A. Josam Manufacturing.

B. Zurn Industries, Inc.

C. J.R. Smith.

2.06 SHOCK ARRESTORS

A. ANSI A112.26.1; sized in accordance with PDI WH-201, precharged suitable for operation in temperature range - 100 to 300 degrees F.

B. Refer to schedule on drawings.

2.07 ACCEPTABLE MANUFACTURERS - HOSE BIBBS

A. Woodford or approved equal.

B. Substitutions: Under provisions of Section on Substitutions.

C. Refer to schedule on drawings for type.

2.08 ACCEPTABLE MANUFACTURERS - BACKFLOW PREVENTORS (BFPR)

A. Hersey Products, Inc.

B. Watts Regulator Co.

C. Zurn Industries, Inc.

2.09 BACKFLOW PREVENTERS (BFPR)

A. Reduced Pressure Backflow preventers: ANSI/ASSE 1013; bronze body with bronze and plastic internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

B. Refer to schedule on drawings.

2.10 TRAP PRIMER

A. Cast brass, copper reservoir, 1/2" threaded connections and integral vacuum breaker.

B. Refer to plumbing schedule on drawings.

2.11 ESCUTCHEONS

A. Chrome plated or stainless steel with set screws for holding securely in place.

2.12 DIELECTRIC FITTINGS

A. Metal parts of union or flange shall be installed to prevent current flow between dissimilar metals. EPCO Dielectric pipe fittings or equivalent.

2.13 VENT FLASHING

A. 16 ounce copper or 4 pound lead flashing and counter flashing. Confirm compatibility with roofing material.

2.14 T&P RELIEF VALVES

A. Valve shall have bronze body, non-mechanical seat-to-disc alignment and shall have a stainless steel thermostat.

B. Valve shall contain an emergency back-up fusible plug.

C. The valves shall be sized on the AGA temperature steam rating.

2.15 PRESSURE REDUCING VALVES

A. Valves shall have bronze body, stainless steel integral strainer, renewable stainless steel seat, high temperature diaphragm and 160# gauge and tapping.

B. Valves shall be provided with built-in thermal expansion by-pass.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate forming of roof and floor construction to receive drains to required invert elevations.

3.02 INSTALLATION AND APPLICATION

A. Install specialties in accordance with manufacturer's instructions to permit intended performance.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install water hammer arrestors complete with accessible isolation valve.

E. Locate trap primer under lavatory on CW supply and/or flush valve as per manufacturers recommendations.

F. Use Escutcheons on pipes passing through walls, floors, and ceilings of finished areas.

G. Seal all openings in sleeves for piping penetrations with UL listed caulk. Refer to detail on drawings.

END OF SECTION 15430

SECTION 15440 - PLUMBING FIXTURES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Water Closets.

B. Lavatories.

C. Service Sinks.

D. Sinks.

E. Fixture Trim.

F. Urinals.

G. Toilet Seats.

H. Floor Sinks.

1.02 RELATED WORK

A. Section 07900 - Joint Sealers: Seal Fixtures to Walls and Floors.

B. Section 15140 - Supports and Anchors.

C. Section 15410 - Plumbing Piping.

D. Section 15430 - Plumbing Specialties.

1.03 REFERENCES

A. ANSI/A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.

B. ANSI/A112.19.2 - Vitreous China Plumbing Fixtures.

C. ANSI A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals.

1.04 QUALITY ASSURANCE

A. Fixtures: By same manufacturer for each product specified throughout, except as indicated otherwise.

B. Trim: By same manufacturer for each product specified throughout or as stated.

1.05 SUBMITTALS

A. Submit product data under provisions of Section 15010, General Conditions and Supplementary General Conditions.

B. Include fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include fixture trim exploded view and replacement parts lists.

1.07 WARRANTY

A. Provide one (1) year manufacturer's warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - FIXTURES

A. American Standard.

B. Kohler.

C. Substitutions: Under provisions of Section 15010 and Division 1.

2.02 ACCEPTABLE MANUFACTURERS - FIXTURE TRIM

A. Delta commercial faucet product.

2.03 ACCEPTABLE MANUFACTURERS - WATER CLOSET SEATS

A. Bemis.

B. Olsonite.

C. Beneke.

2.04 ACCEPTABLE MANUFACTURERS - FIXTURE CARRIERS

A. Zurn Industries, Inc.

B. Josam Manufacturing.

C. J.R. Smith

D. Substitutions: Under provisions of Section 15010 and Division 1.

2.05 WATER CLOSET

A. See Drawing Specification.

2.06 LAVATORY

A. See Drawing Specification.

2.07 SERVICE SINK

A. See Drawing Specification.

2.08 SINKS

A. See Drawing Specification.

2.09 URINAL

A. See Drawing Specification.

2.10 FLOOR SINKS

A. See Drawing Specification.

2.11 DRINKING FOUNTAINS

A. See Drawing Specification.

PART 3 - EXECUTION

3.01 INSPECTION

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

B. Verify adjacent construction is ready to receive rough-in work of this Section.

3.02 INSTALLATION

A. Provide a cast brass trap at each fixture with removable cleanout for servicing and cleaning.

B. Provide chrome plated stops with rigid supplies to fixtures with loose key stops, reducers, and escutcheons. All stops shall have renewable seats and disks.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall carriers and bolts.

E. Seal fixtures to wall and floor surfaces with Silicone sealant as to match fixture.

F. Install all handicapped fixtures per ANSI A117.1-1986.

3.03 ADJUSTING AND CLEANING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

B. At completion clean plumbing fixtures and equipment.

C. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.

3.04 FIXTURE ROUGH-IN SCHEDULE

A. Rough-in fixture piping connections in accordance with table of minimum sizes for particular fixtures shown with fixture schedule. (Refer to drawings.)

END OF SECTION 15440

SECTION 15450 - PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Electric Water Coolers.

B. Water Heaters.

C. Vacuum Breakers (required on water heaters).

1.02 RELATED WORK

A. Section 15140 - Supports and Anchors.

B. Section 15260 - Piping Insulation.

C. Section 15400 - Testing of Piping Systems.

D. Section 15410 - Plumbing Piping.

1.03 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. ARI 1010 - Drinking Fountains and Remote Chilling Package.

C. UL 174 - Household Electric Storage Tank Water Heaters.

1.04 QUALITY ASSURANCE

A. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:

1. National Sanitation Foundation (NSF).

2. American Society of Mechanical Engineers (ASME).

3. National Electrical Manufacturers' Association (NEMA).

4. Underwriters Laboratories (UL).

1.05 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 70 and UL 174 requirements for water heaters.

1.06 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 15010 and Division 1.

B. Include dimension drawings of water heaters indicating components and connections to other equipment and piping.

1.07 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 15010 and Division 1.

B. Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

C. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.09 WARRANTY

A. Provide ten (10) year manufacturer's limited warranty under provisions of Division 1.

B. Warranty: Include coverage of domestic water heaters.

C. Warranty: Include coverage of electric water cooler compressor for five (5) years.

PART 2 - PRODUCTS

2.01 ELECTRIC WATER HEATERS

A. Refer to plumbing fixture schedule on drawings.

2.02 VACUUM BREAKERS

A. Refer to plumbing fixture schedule on drawings.

B. Provide a Series 288A as manufactured by Watts Reg. Co. or approved equal. Vacuum breaker shall be installed on all side inlet water heaters and top inlet water heaters which do not incorporate a vacuum breaker in the dip tube.

2.03 ELECTRIC WATER COOLERS

A. Refer to plumbing fixture schedule on drawings.

PART 3 - EXECUTION

3.01 WATER HEATER INSTALLATION

A. Install water heater and chiller in accordance with manufacturer's instructions and to NFPA and UL requirements.

B. Coordinate with plumbing piping and related electrical work to achieve operating system.

END OF SECTION 15450

SECTION 15890 - METAL DUCTWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

A. Extent of metal ductwork is indicated on drawings and in schedules, and by requirements of this section.

B. Refer to other Division 15 sections for exterior insulation of metal ductwork; not work of this section.

C. Refer to other Division 15 sections for ductwork accessories; not work of this section.

D. Refer to other Division 15 sections for fans and air handling units; not work of this section.

E. Refer to other Division 15 sections for testing, adjusting and balancing of metal ductwork systems; not work of this section.

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of metal ductwork products of types, materials, and sizes required, whose projects have been in satisfactory use in similar service for not less than five (5) years.

B. Installer's Qualifications: Firm with at least five (5) years of successful installation experience on projects with metal ductwork systems similar to that required for project.

C. Codes and Standards:

1. SMACNA Standards: Comply with SMACNA's "HVAC Duct Construction Standards, Metal and Flexible" for fabrication and installation of metal

ductwork.

2. ASHRAE Standards: Comply with ASHRAE Handbook, Equipment Volume, Chapter 1 "Duct Construction", for fabrication and installation of metal ductwork.

3. NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" and NFPA 90B "Standard for the Installation of Warm Air Heating and Air Conditioning Systems".

D. Field Reference Manual: Have available for reference at project field office, copy of SMACNA "HVAC Duct Construction Standards, Metal and Flexible".

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for metal ductwork materials and products.

B. Record Drawings: At project closeout, submit record drawings of installed metal ductwork and ductwork products, in accordance with requirements of Division 1.

C. Maintenance Data: Submit maintenance data and parts lists for metal ductwork materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 1.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protection: Protect shop-fabricated and factory-fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling. Prevent end damage and prevent dirt and moisture from entering ducts and fittings.

B. Storage: Where possible, store ductwork inside and protect from weather. Where necessary to store outside, store above grade and enclose with waterproof wrapping.

PART 2 - PRODUCTS

2.01 DUCTWORK MATERIALS

A. Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ASTM A 527, lock-forming quality; with G 90 zinc

coating in accordance with ASTM A 525; and mill phosphatized for exposed locations.

2.02 MISCELLANEOUS DUCTWORK MATERIALS

A. General: Provide miscellaneous materials and products of types and sizes

indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.

B. Fittings: provide radius type fittings fabricated of multiple sections with maximum 15 degree change of direction per section. Unless specifically detailed otherwise, use 45 degree laterals and 45 degree elbows for branch takeoff connections. Where 90 degree branches are indicated, provide conical type tees.

C. Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.

D. Duct Cement: Non-hardening migrating mastic or liquid neoprene based cement, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for cementing fitting components, or longitudinal seams in ductwork.

E. Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.

F. Flexible Ducts: Either spiral-wound spring steel with flameproof vinyl sheathing, or corrugated aluminum; complying with UL 181.

1. Where installed in unconditioned spaces other than return air plenums, provide 1" thick continuous flexible fiberglass sheath with vinyl vapor barrier jacket.

2.03 FABRICATION

A. Shop fabricate ductwork in 4, 8, 10 or 12 ft. lengths, unless otherwise indicated or required to complete runs. Preassemble work in shop to greatest extent possible, so

as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for reassembly and coordinated installation.

B. Shop fabricate ductwork of gages and reinforcement complying with SMACNA "HVAC Duct Construction Standards".

C. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to associated duct width; and fabricate to include turning vanes in elbows where shorter radius is necessary. Limit angular tapers to 30 degree for contracting tapers and 20 degree for expanding tapers.

D. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Refer to Division 15 section "Ductwork Accessories" for accessory requirements.

PART 3 - EXECUTION

3.01 INSPECTION

A. General: Examine areas and conditions under which metal ductwork is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 INSTALLATION OF METAL DUCTWORK

A. General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight (5% leakage for systems rated 3" and under; 1% for systems rated over 3") and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling. Support vertical ducts at every floor.

B. Field Fabrication: Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements.

C. Routing: Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by

diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

D. Installation: Install metal ductwork in accordance with SMACNA HVAC Duct Construction Standards.

3.03 INSTALLATION OF FLEXIBLE DUCTS

A. Maximum Length: For any duct run using flexible ductwork, do not exceed 6'-0" extended length.

B. Installation: Install in accordance with Section III of SMACNA's "HVAC Duct Construction Standards, Metal and Flexible".

3.04 FIELD QUALITY CONTROL

A. Leakage Tests: After each duct system which is constructed for duct classes over 3" is completed, test for duct leakage in accordance with SMACNA HVAC Air Duct Leakage Test Manual. Repair leaks and repeat tests until total leakage is less than 1% of system design air flow.

3.05 EQUIPMENT CONNECTIONS

A. General: Connect metal ductwork to equipment as indicated, provide flexible connection for each ductwork connection to equipment mounted on vibration isolators, and/or equipment containing rotating machinery. Provide access doors as indicated.

3.06 ADJUSTING AND CLEANING

A. Clean ductwork internally, unit by unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of

metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.

B. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of duct and debris until time connections are to be completed.

C. Balancing: Refer to Division 15 section "Testing, Adjusting, and Balancing" for air distribution balancing of metal ductwork; not work of this section. Seal any leaks in ductwork that become apparent in balancing process.

END OF SECTION 15890

SECTION 15910 - DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Volume Control Dampers.

B. Air Turning Devices.

C. Flexible Duct Connections.

D. Duct Test Holes.

E. Access Doors.

F. Fire Dampers.

G. Air Extractors.

H. Equalizing Grids.

I. Stationary Louvers.

1.02 RELATED WORK

A. Section 15010 - Basic Mechanical Requirements.

B. Section 15890 - Ductwork

1.03 REFERENCES

A. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

B. SMACNA - Low Pressure Duct Construction Standards.

1.04 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

PART 2 - PRODUCTS

2.01 VOLUME CONTROL DAMPERS - (BALANCING)

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.

B. Fabricate multi-blade damper of opposed blade pattern for ducts more than 12" in height and single blade dampers for ducts 12" in height or less with maximum blade length of 48 inches. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

C. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches, provide regulator at both ends.

2.02 AIR TURNING VANES

A. Turning Vanes Over 36 Inches:

1. Multi-blade device with double thickness air foil blades with long trailing edge vanes, aligned in short dimension, steel or aluminum construction, with individually adjustable blades, mounting straps. Refer to SMACNA HVAC Duct Construction Standards, First Edition, for spacing, reinforcing, and other construction quality details.

B. Turning Vanes Up To 36 Inches:

1. Single blade device with long trailing edge vanes, aligned, steel or aluminum construction, with individually adjustable blades, mounting straps. Refer to SMACNA HVAC Duct Construction Standards, First Edition, for spacing, reinforcing, and other construction quality details.

2.03 DUCT CONNECTIONS

A. Fabricators in accordance with SMACNA HVAC Duct Construction Standards, and as indicated.

B. Rectangular to Round Runout and Branch Connection:

1. Provide Bellmouth spin-in collar fittings installed per manufacturer's recommendation and in accordance with SMACNA. Provide metal clamps

to secure insulation and vapor barrier over the core connection.

2. Fittings shall be completely insulated and taped.

C. Air Handler Duct Connection:

1. Provide UL listed, fire-retardant, neoprene coated woven glass fiber fabric to NFPA 90A, minimum density, 36 oz. per sq. yd., approximately 6 inches wide, crimped into metal edging strip.
2. Connections shall be completely insulated and taped.

2.04 DUCT TEST HOLES

A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.05 ACCESS DOORS

A. Access doors shall be provided at all main volume dampers, automatic dampers, before and after booster heaters, air flow measuring stations, thermostats in fan discharges, control devices, fire dampers and other locations where duct access is required.

B. Doors shall be constructed of #22 gauge metal minimum or at least two (2) gauges heavier than duct. Door material shall be same as duct system.

C. Doors shall be provided with a flat iron or angle iron stiffening frame and so constructed that they can be operated without twisting or distortion. Doors on insulated ductwork shall be of double panel construction, provided with an approved type insulated filler not less than 1" thick. The duct opening at each door shall be provided with a continuous reinforcing galvanized bar or angle against which the door will close, this being provided with a latex foam gasket. Gasket shall be held to bar or angle by applying a flameproof adhesive. All access doors shall be hinged, minimum two (2) hinges.

D. Door frames on insulated ductwork shall be placed on an extended metal collar flush with the face of the finished insulation.

E. Doors shall be gasketed air tight.

F. Access door and hardware shall be submitted for approval before fabrication.

G. Access door on air handling unit shall open out on draw-through unit and open in on blow through units.

2.06 FIRE DAMPERS

A. Provide UL labeled fire dampers for horizontal and vertical openings in shaft, fire rated partitions and floors as shown on the Drawings. Dampers shall provide 100% of the duct-free area. Dampers shall be built and tested in accordance with NFPA 90A, latest edition. Damper shall be continuous stainless spring steel curtain, guided on a center rod and shall close by it's own inertia from any position. Damper shall lock in closed position. Frame shall be 18 gauge cold-rolled steel. Dampers shall be installed in duct extension sleeves and with perimeter angles and breakaway fittings in accordance with the Manufacturer's instructions and SMACNA details.

B. Fire dampers shall be as manufactured by Phillips Aire, Model FD, by Air Balance, Inc. or Ruskin or pre-approved equal (per Section 15010).

2.07 AIR EXTRACTOR

A. Provide a multi-curved blade air painted air extractor at each branch connection to main supply duct.

B. The unit shall consist of a bank of curved blades, usually parallel to the short dimension, and four (4) heavy side rails. When being adjusted, the whole unit shall pivot on the attachment plate. Each blade shall be synchronized with the other so that the unit deflects the air uniformly across the branch take-off. When closed, the blades shall overlap for full shut-off.

C. Unit shall consist of linkage and external operator knob.

D. Lengths over sixteen inches (16") or heights over eight inches (8") shall be provided with channel supports below the unit to prevent sagging.

E. Air extractors shall be model RXVA as manufactured by Carnes or approved equal by Kruger or Titus.

2.08 EQUALIZING GRID

A. Each diffuser or register stub duct shall be provided with an equalizing grid with individually adjusted blades.

2.09 STATIONARY LOUVERS

A. Exterior stationary louvers; refer to Section 10200, Metal Louvers.

B. Door/transfer grilles.

1. Shall be all extruded aluminum.
2. Shall have 70° apposed angle, inverted 1" "V" louvers assembled with a slight overlap.
3. Finish: To be selected by the Architect.

C. Provide extruded aluminum brick or block vents with mesh insect screen where shown on the drawings.

D. Approved Manufacturers:

1. Air Balance
2. Air Line Products
3. Construction Specialties
4. Metalaire

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions.

B. Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing.

C. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

D. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.

E. Provide duct test holes where required for testing and balancing purposes.

F. Provide 18" x 18" access doors in ductwork within 6-8 feet of each air handler for both the return and supply.

END OF SECTION 15910

SECTION 15936 - AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Registers/Grilles.

B. Louvers (refer to Section 15910).

1.02 RELATED WORK

A. Section 15010 - Basic Mechanical Requirements.

B. Section 15890 - Ductwork

1.03 REFERENCES

A. ADC 1062 - Certification, Rating and Test Manual.

B. AMCA 500 - Test Method for Louvers, Dampers and Shutters.

C. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

D. ARI 650 - Air Outlets and Inlets.

E. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.

F. SMACNA - Low Pressure Duct Construction Standards.

1.04 QUALITY ASSURANCE

A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

B. Test and rate performance of louvers in accordance with AMCA 500.

1.05 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 90A.

1.06 SUBMITTALS

A. Submit product data under provisions of Section 15010, General Conditions, and Supplementary General Conditions.

B. Provide product data for items required for this project.

C. Submit schedule of outlets and inlets indicating type, size, location, application, and noise level.

D. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data and schedules of outlets and inlets.

E. Submit engineering data in a manner to facilitate convenient review of aspiration ability, including temperature and velocity traverses, throw and drop, noise criteria ratings sizes, free area and quality of construction. Outlets shall be selected for maximum noise criteria level as scheduled on drawings.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - CEILING DIFFUSERS AND REGISTERS

A. Metalaire.

B. Titus (Basis of Design).

C. Kruger.

D. Substitutions: Upon prior approval.

2.02 CEILING DIFFUSERS, REGISTERS, AND GRILLES

A. Fabricate aluminum and baked enamel white finish. (Refer to schedule on drawings.)

B. Provide opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffusers and registers faces.

C. Coordinate frame type with latest architectural reflected ceiling plan.

D. Refer to schedule on drawings for type and model number.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install items in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement. Refer to Section 09900.

C. Install diffusers, registers and grilles to ductwork with air tight connection.

D. Provide balancing dampers in diffusers and registers.

E. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09900.

END OF SECTION 15936

SECTION 15990 - TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.01 SUMMARY STATEMENT

A. Test and balance of HVAC systems supply, return, and exhaust systems shall be performed by an independent test and balance agency certified by AABC or NEBB. The cost of the TAB services are a part of the base bid for this Contract. The TAB services provided herein shall be completed and the written report submitted to the Engineer a minimum of fifteen (15) days prior to Substantial Completion of each project phase.

1.02 RELATED DOCUMENTS

A. The requirements set forth in the Bidding Requirements and the Contractual Conditions of Division One shall apply to this Section.

B. The requirements of Section 15010 - Basic Mechanical Requirements shall be adhered to in the test and balance work which shall include Sections 15260 - Pipe Insulation and 15890 - Ductwork.

1.03 SCOPE OF WORK

A. Description:

1. The Contractor shall, at the Contractor's expense, procure the services of an independent testing and balance firm which specializes in the balancing and testing of heating, ventilating and air conditioning systems. This specialty services firm shall balance, adjust and test water circulation, air moving equipment, air distribution and/or exhaust systems as herein specified.
2. Test and balance work shall not begin until all systems have been completed and are in full working order to the satisfaction of the Project Architect/Engineer and the Owner. This Contractor shall make all preliminary tests and adjustments before advising in writing that test and balance work is ready to begin and shall place all systems and equipment into full operation during each working day of testing and balancing.

B. Replacement pulleys (adjustable and non-adjustable), additional balancing dampers, pressure taps, balancing valves, cocks and fittings, etc., required to effect proper air

and water balance shall be furnished and installed by this Contractor at no additional cost to the Owner. This Contractor shall do this

work as soon as possible so as not to delay the completion of the test and balance work.

C. Air filters shall be replaced and strainers shall be cleaned by this Contractor before proceeding with test and balance and thereafter as required by the test and balance firm.

D. Systems shall be placed into service using approved start up procedures. This (mechanical) contractor shall be responsible for proper initial setting and adjustment of HVAC equipment, air handlers, VAV boxes, exhaust fans, etc. furnished and installed by him.

E. This Contractor shall provide test openings as required; shall operate HVAC equipment and provide trades persons to assist and make adjustments for test and balance during the process.

F. The Contractor's test and balance firm shall periodically visit the site during construction of the HVAC system. No less than two (2) visits per phase will be made. Should methods, materials or workmanship being used adversely affect balancing and adjusting work, the test and balance agency shall report its findings in writing to the Contractor with recommendations for correction.

G. The Contractor's test and balance firm has agreed or shall agree to carry out the test and balance in accordance with the AABC National Standards for Total Systems Balance, 1982 or the NEBB Procedural Standards for Testing, Adjusting and Balancing or Environmental Systems, Fourth Edition, and in conformance with ASHRAE Handbook, 1986, Chapter 37, Testing, Adjusting and Balancing and as outlined in this Specification Section.

H. This Contractor shall furnish to the testing and balancing agency a complete set of plans and specifications, addenda, shop drawings, schedules and change orders as may be required.

1.04 QUALITY ASSURANCE

A. The final result of balancing shall be to provide uniform air temperatures within a two (2) degree F spread in the conditioned space at peak load conditions.

B. All instruments used shall be accurately calibrated within six months of testing and balancing and shall be maintained in good working order.

C. In the event of a dispute, the Owner or Contractor or Project Architect/Engineer may choose to provide verification of test and balance reports, and such verification shall be by a third independent agency selected by the Engineer. Reports found to be inaccurate will be disallowed, and the Contractor's test and balance firm will be required to repeat operations under the supervision of the third independent agency until accurate reports are completed and agreed upon, provided the Contractor's TAB firm is found to be at fault in the judgement of the Engineer. The cost of disputed test and balance work shall be borne by the Owner or Contractor (whichever is found to be at fault).

1.05 SUBMITTALS

A. The test and balance firm will submit two (2) copies of data for the testing and balancing for the approval of the Project Architect/Engineer, three (3) file copies to the Owner and two (2) copies to this Contractor.

B. All data and information shall be compiled in a neat, orderly format on 8-1/2" x 11" test forms and shall be signed and sealed by the certified individual as previously described.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 AIR BALANCE

A. This contractor shall prepare the air systems for balancing and verify same for test and balance firm as follows:

1. Mechanically check fans, blowers and air handling equipment and make such available to operate under design conditions.
2. Set volume dampers, air dampers and vanes in their normal position.
3. Set grilles, diffusers, etc. installed with vanes, blades in their normal position.
4. Mechanically check controls, whether they are electronic, electric or pneumatic or a combination thereof, and make available to operate under design conditions.

5. Mark damper shafts and locking devices to accurately represent the position of their respective dampers when in optimum position.

B. The Contractor's test and balance firm shall perform the following tests and balance system in accordance with these requirements:

1. Test and adjust fan RPM to design requirements.
2. Test and record motor full load amperes. Verify the sizing and settings of overloads as well as document same on reports. Coordinate with Division 16 to install and size overloads to NEC and manufacturer's requirements.
3. Make pitot tube traverse of main supply and return ducts and obtain design CFM at fans.
4. Test and record system total pressures, suction and discharge.
5. Test and adjust system for design CFM recirculated air.
6. Test and record coil entering air temperatures (D.B. heating and cooling).
7. Test and record coil entering air temperatures (W.B. cooling).
8. Test and record coil leaving air temperatures (D.B. heating and cooling).
9. Test and record coil leaving air temperatures (W.B. cooling).
10. Adjust all main supply and return air ducts to proper design CFM.
11. Adjust all zones to proper design CFM ($\pm$10%), supply and return. Show all DDC readings at time of measured readings. Coordinate with Controls Contractor to resolve differences.
12. Test and adjust each diffuser, grille,and register to within $\pm$10% of design requirements.
13. Each grille, diffuser and register shall be identified as to location, area and system.
14. Test and record all room temperatures, DB and WB. Test shall be made near room thermostat where installed at four feet above floor.

C. Size, type and manufacturer of diffusers, grilles, registers, and all tested equipment shall be identified and listed. Manufacturer's ratings on all equipment shall be used to made required calculations.

D. Readings and tests of diffusers, grilles and registers, shall include test resultant velocity, required CFM and test resultant CFM after adjustments.

E. In cooperation with the control manufacturer's representative, the test and balance firm shall set adjustments of automatically operated dampers to operate as specified, indicated, and/or noted.

F. Testing and balance firm shall check all controls for proper calibrations and list all

controls requiring adjustment by control installers.

G. Diffusers, grilles and registers shall be adjusted by the test and balance firm to minimize drafts in all areas.

H. The test and balance firm shall verify duct work leakage tests. Data from duct work leakage tests shall be tabulated and included with the test and balance report. Leakage tests per SMACNA requirements shall be performed.

I. Tested section of duct work shall be marked by this Contractor and verified by the test and balance firm. All tests and repairs shall be made before duct sections are concealed or insulated.

3.02 SOUND TESTING

A. Using approved instruments, the test and balance firm shall conduct tests in selected areas of the building as specified below. Sound level readings shall be measured in decibels on the "A" and "C" scales of the General Radio Company sound level meter, or equal sound level meter that meets the current American Standards (224.3-1944) based on the acoustic reference power of DB/RE 10.13 watts. Readings shall set forth the total random sound level of the selected rooms or areas with the system in operation, as compared to total background sound level with the system not in operation. The system increase over the background level shall be recorded in decibels on the "A" and "C" scales. If sound levels are above those listed below, adjustments shall be made by this Contractor to bring the sound level within the range set forth. If this cannot be done with the equipment as installed, recommendations shall be made by the test and balance firm to correct the sound level to within the specified range. Additions of sound traps, insulation, or dampers shall be made by this Contractor under the direction of the balance agency at no additional cost to the Owner, provided the noise is due to Contractor's fault. Sound level readings (in decibels) shall be taken at each diffuser, grille or register in occupied areas. The sound levels shall be approximately 45 degrees to the center of the diffuser, etc., on the "A" and "C" scales of a General Radio Company sound level meter. The computed equivalent sound level meter readings weighting scale "A" (DBA) shall not exceed 40 for general office type space, 35 for classroom and conference room type space and 30 for sensitive areas such as libraries or auditoriums.

B. Sound measurements shall be taken in the following locations:

1. A typical office or classroom remote from mechanical equipment rooms.
2. A typical office or classroom adjacent to mechanical equipment room.
3. Typical offices.
4. Special assembly rooms such as auditoriums, music rooms, libraries.

C. When a typical space (1, 2 or 3 above) has been tested and passed, all such spaces shall be considered complying. Conversely, if a typical space fails, all such spaces shall be considered as failed and require testing.

D. Unless test results indicate failure to comply with the intention of these Specifications, sound testing shall be done only once, preferably during cooling season.

E. Sound levels at maximum rates shall be listed on the TAB report on a point measured basis as required above.

3.04 EQUIPMENT

A. The test and balance agency shall submit, as part of its report, complete identification and operating data on the following:

1. Air handling units and fans.
2. New air devices (grilles, registers, diffusers).
3. Condensers
4. Exhaust fans

3.05 CERTIFICATION

A. The test and balance report to the Project Architect/Engineer and to the Owner shall be signed, "sealed" and certified by a certified balancing agent in the State of Florida whose specialty discipline is HVAC, together with a signed statement that this balancer's specialty is HVAC.

END OF SECTION 15990

SECTION 16010 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Basic Electrical Requirements specifically applicable to Division 16 Sections, in addition to Division 1 - General Requirements.

1.02 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. NFPA 101 - Life Safety Code.

C. NFPA 101 - Life Safety Code.

D. Florida Department of Education Accessibility Guidelines and Requirements.

1.03 SUBMITTALS

A. Submit under provisions of Division 1.

B. Proposed Products List: Include Products specified in the following Sections, but not limited to:

1. Section 16141 - Wiring Devices
2. Section 16160 - Cabinets and Enclosures
3. Section 16440 - Disconnect Switches
4. Section 16470 - Panelboards
5. Section 16721 - Fire Alarm, Smoke Detection, and Security System

C. All shop Drawings shall be submitted to the Architect/Engineer by Contractor no later than thirty (30) days from the day of Contract aware unless otherwise noted or scheduled.

1.04 REGULATORY REQUIREMENTS

A. Conform to Florida Department of Education Rule 6A-2.

B. Electrical: Conform to NFPA 70 and 101.

C. Obtain permits, and request inspections from authority having jurisdiction.

D. Conform to Florida Department of Education Accessibility Guidelines and Requirements.

1.05 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

C. The Contractor shall inform the Architect/Engineer of any Work or materials which conflict with any of the applicable codes, standards, laws and regulations before submitting his bid.

D. The scope of the Work included under this Division of the Specifications shall include complete electrical systems as shown on the plans and as specified herein. The General Conditions and Special Conditions of these specifications shall form a part and be included under this Section of the Specifications. Provide all supervision, labor, material, equipments, machinery, factory trained personnel, and any and all other items necessary to complete the electrical systems. All items of equipment are specified in the singular; however, provide and install the number of items of equipment as indicated on the Drawings, and as required for complete systems.

1.06 SEQUENCING AND SCHEDULING

A. Construct Work in sequence under provisions of Division 1.

1.07 ACCESS DOORS FOR WALLS AND CEILINGS

A. Provide flush panel access doors with a 16 gauge steel frame and a 14 gauge steel door panel.

B. Finish is to be primed painted steel.

C. Provide concealed hinges which allow the door to open 175 degrees and have a removable pin.

D. Provide access doors with a locked flush mounted vandal proof spanner header operated steel cams.

E. Provide 1-1/2 hour "B" label door for rated chase walls.

F. Furnish masonry anchors for installation in masonry walls and metal lath wings with casing bead for plaster installation.

G. Provide a minimum 2'-0" by 2'-0" access doors unless shown or noted otherwise on the Drawings.

H. Access doors for chase walls shall be mounted 16" off the finish floor.

I. Access doors for electrical equipment, devices, and junction boxes shall be a minimum of 12" larger than equipment all around.

1.08 LICENSE

A. The subcontracting firm for the electrical systems installation shall be licensed by the State of Florida and the local authorities, regularly engaged in the installation of electrical systems and other related equipment. The subcontracting firm shall be familiar with all local conditions including interpretations, codes and shall have at least five (5) years of successful installation experience on similar project of the same magnitude and scope. The subcontracting firm shall list at least three (3) project it has successfully completed over the last five years for proof of experience of this caliber. This list shall be included with submittals for review by Architect/Engineer. The subcontracting firm shall hold a Florida State Certified Electrical Contractor license for this project. The subcontracting firm for the fire alarm system shall be a certified "EF" installer.

END OF SECTION 16010

SECTION 16060 - GROUNDING AND BOUNDING

PART 1 - GENERAL

1.01 SECTION INCLUDES

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 methods and materials for groundling systems an equipment.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Other Informational Submittals: Plans showing dimensioned as-build locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:

1. Ground rods.

C. Field quality-control test reports.

1.04 QUALITY ASSURANCE

A. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.01 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V or unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inc (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 (1.6 mm) thick..
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches 941 mm) wide and 1/16 inch (1.6 mm) thick.

2.02 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sized, and combinations of conductors and other items connected.

B. Bolted connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.03 GROUNDING ELECTRODES

A. Ground Rods: Copper clad, sectional type, 5/8 by 96 inches (16 x 24000 mm) in diameter.

PART 3 - EXECUTION

3.01 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stipe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least

three bands of green and two bands of yellow.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.02 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:.

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating a 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct connected metallic piping.

D. Water Heater: Install a separate insulated equipment grounding conductor to each electric water heater. Bond conductor to heater units, piping, connected equipment and components.

E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

F. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment provide No. 4 AWG minimum insulated grounding

conductor in raceway from grounding electrode system to each service location.

3.03 INSTALLATION

A. Grounding Conductors: Route along shortest straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where the may be subjected to strain, impact or damage.

B. Grounds Rods: Drive rods until tops are 2 inches (50 mm) below finished or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
2. For grounding electrode system install at least two (2) rods spaced at least one-rod length from each other located at least the same distance form other grounding electrodes, and connect to the service grounding electrode conductor.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, expect where routed through short lengths of conduit.

1. Bonding to structure: Bond straps directly to basic structure, taking care not to penetrate nay adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

1. Bond each aboveground portion of metal piping system.

E. Bounding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, bowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

3.04 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure ground terminal. Make test at ground rods before any conductors are connected.

    a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform test by fall-of-potential method according to IEEE 81.

B. Report measured ground resistance that exceed the following values:

1. Power and Lighting Equipment or System with Capacity 500 kVA and less: 10 ohms.

C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 16060

SECTION 16111 - CONDUIT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Metal conduit.

B. Flexible metal conduit.

C. Liquid tight flexible metal conduit.

D. Electrical metallic tubing.

E. Nonmetal conduit.

F. Fittings and conduit bodies.

1.02 RELATED SECTIONS

A. Section 03300 - Cast-in-Place Concrete.

B. Section 16130 - Boxes.

C. Section 16195 - Electrical Identification.

1.03 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

C. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

D. ANSI/NFPA 70 - National Electric Code.

E. NECA "Standard of Installation."

F. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

G. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.04 DESIGN REQUIREMENTS

A. Conduit Size: ANSI/NFPA 70.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01720.

B. Accurately record actual routing of conduits larger than 1-1/4 inches.

C. Accurately record actual routing of all underground conduits.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle Products to site under provisions of Division 1.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

1.07 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

PART 2 -PRODUCTS

2.01 CONDUIT REQUIREMENTS

A. Minimum Size: 3/4 inch unless otherwise specified. 1/2 inch for flexible connections to equipment.

B. Underground Installations:

1. More than Five Feet from Foundation Wall: Use thickwall nonmetallic conduit.

2. Within Five Feet from Foundation Wall: Use rigid steel conduit painted with a coat of Bitumastic.
3. In or Under Slab on Grade: Use rigid steel conduit. Paint under slab conduit or poured-in concrete with a coat of Bitumastic, continuously and up through penetration of concrete slabs.
4. Minimum Size: 3/4.

C. Outdoor Locations, Above Grade, Concealed: Use rigid steel and liquid-tight flexible metal conduit.

D. Wet and Damp Locations: Use rigid steel and liguidtight flexible metal conduit.

E. Dry Locations:

1. Concealed: use rigid steel, intermediate metal conduit, and electrical metallic tubing.
2. Exposed: Use rigid steel below eight feet and electrical metallic tubing above eight feet.

2.02 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; all steel fittings.

2.03 FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction.

B. Fittings: ANSI/NEMA FB 1.

2.04 LIQUID TIGHT FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction with PVC jacket.

B. Fittings: ANSI/NEMA FB.1.

2.05 ELECTRICAL METALLIC TUBING (EMT)

A. Description: ANSI C80.3; galvanized tubing.

B. Fitting and Conduit Bodies: ANSI/NEMA FB 1; steel compression type.

2.06 NONMETALLIC CONDUIT

A. Description: NEMA TC 2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

C. PVC Conduit shall not be ran in or within 5'-0" of any building or structure.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install conduit in accordance with NECA "Standard of Installation".

B. Install nonmetallic conduit in accordance with manufacturer's instructions.

C. Arrange supports to prevent misalignment during wiring installation.

D. Support conduit using coated steel straps, lay-in adjustable hangers, clevis hangers, and split hangers.

E. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

F. Fasten conduit support to building structure and surfaces.

G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

H. Do not attach conduit to ceiling support wires.

I. Arrange conduit to maintain headroom and present neat appearance.

J. Route exposed conduit parallel and perpendicular to walls. Exposed conduits shall

only be run in mechanical and electrical rooms.

K. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

L. All conduit run in public areas, classrooms, offices, restrooms, hallways, etc., shall be concealed. Saw cut walls and floor slabs. Make arrangements with General Contractor to patch all areas with no additional cost to Owner.

M. Do not cross conduits in slab.

N. Provide 4" cast-in-place concrete curbs at electrical distribution panel conduit connections for conduits stubbed-up from below slab.

O. Maintain minimum six inch (6") clearance between conduit and piping.

P. Maintain 12 inch (12") clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C).

Q. Cut conduit square using saw or pipecutter; de-burr cut ends.

R. Bring conduit to shoulder of fittings; fasten securely.

S. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

T. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

U. Install no more than equivalent of four 90-degree ends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender or factory elbows for bends in metal conduit larger than 2 inch size.

V. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

W. Provide suitable fittings to accommodate expansion and deflection where conduit crosses, control, and expansion joints.

X. Provide No. 12 AWG insulated conductor or suitable pull string in each empty

conduit except sleeves and nipples.

Y. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

Z. Ground and bond conduit under provisions of Section 16170.

AA. Identify conduit under provisions of Section 16195.

AB. Install rigid steel long radius elbows, size 2" and larger, in below grade and first floor slab conduit runs. Encase elbows with minimum 3" concrete coverage.

AC. Exterior conduit stub ups shall be rigid galvanized coated with bitumastic. Concrete encase with a minimum 3" coverage from beginning of 90 degree elbow stub up to 3" above grade.

AD. Maintain manufacturer's recommended minimum bending radius on flexible conduit.

AE. Flexible metal conduit shall not be over six feet (6') long. Motors three feet (3') long.

AF. Flexible metal conduit shall be used for a flexible connection only, not raceways.

AG. Liquidtight flexible conduit shall be used in wet location and mechanical room for flexible connections only.

AH. Install insulated bushing on all conduits.

AI. Install grounded metal insulated busing with lug on all mains and sub-feeders.

AJ. Install and seal boxes and conduit in acoustical treated walls and ceilings per architectural acoustics specifications.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods that are UL listed and tested.

B. Route conduit through roof openings for piping and ductwork or through suitable roof penetration.

END OF SECTION 16111

SECTION 16120 - BUILDING WIRE AND CABLE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Building wire and cable.

B. Remote control and signal cable.

C. Power limited fire protective signaling cable.

D. Wiring connectors and connections.

1.02 RELATED SECTIONS

A. Section 16111 - Conduit.

B. Section 16130 - Boxes.

C. Section 16195 - Identification.

1.03 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. NEMA WC5 - Thermoplastic-insulated wire and cable for the transmission and distribution of electrical energy.

1.04 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Conductor sizes are based on copper.

C. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.05 COORDINATION

A. Coordinate Work under provisions of Division 1.

B. Determine required separation between cable and other work.

C. Determine cable routing to avoid interference with other work.

PART 2 - PRODUCTS

2.01 BUILDING WIRE AND CABLE

A. Description: Single conductor insulated wire.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: ANSI/NFPA 70, Type THHN/THWN, XHHW material rated 90 degrees C.

2.02 CLASS 1 REMOTE CONTROL AND SIGNAL CABLE

A. Description: ANSI/NFPA 70, Type TFFN, THHN.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

2.03 CLASS 2 OR 3 REMOTE CONTROL AND SIGNAL CABLE

A. Description: NEMA/ICEA WC5, thermoplastic insulated cable, individual insulated conductors twisted together, metallic shielded an covered with PVC jacket when installed in metal raceway.

B. Conductor: copper, stranded.

C. Insulation voltage rating: 300 volts.

2.04 CLASS 1 AND NON-POWER - LIMITED FIRE PROTECTIVE SIGNALING CABLES

A. Description: NEMA/NFPA 70, type TFFN, THHN installed in metal raceway.

B. Conductor: Copper.

C. Insulation voltage rating: 600 volts.

2.05 POWER LIMITED FIRE PROTECTIVE SIGNALING CABLES

A. Description: NEMA/NFPA 70, type TFFN, installed in metal raceway.

B. Conductor: Copper.

C. Insulation voltage rating: 600 volts.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

3.02 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.03 WIRING METHODS

A. Concealed Dry Interior Locations: Use only building wire and cable (all types) in raceway.

B. Exposed Dry Interior Locations: For feeders, branch circuits, and class 1 remote control circuits, use only building wire in raceway. For class 2 or 3 control cable and power limited fire protective signaling cables run in raceway.

C. Above Accessible Ceilings: For feeders, branch circuits and class 1 remote control cables use only building wire in raceway. For class 2 or 3 remote control cables run exposed. For power limited fire protective signaling cables run in raceway.

D. Wet or Damp Interior Locations: For feeders, branch circuits and class 1 remote control cables use only building wire in raceway. For class 2 or 3 remote control cable and power limited fire protective signaling cables run in raceway.

E. Exterior Locations: For feeders, branch circuits and class 1 remote control cables use only building wire run in raceway. For class 2 or 3 remote control cables and fire protective signaling cables run in raceway.

F. Underground Installations: For feeders, branch circuits and class 1 remote control cables use only building wire run in raceway. For class 2 or 3 remote control cables and for power limited fire protective signaling cables run in raceway.

G. Use wiring methods indicated on Drawings.

3.04 INSTALLATION

A. Install products in accordance with manufacturers instructions.

B. Each receptacle circuit shall have a dedicated neutral conductor.

C. Use solid conductor for feeders and branch circuits 10 AWG and smaller.

D. Use stranded conductors for control circuits and for feeder and branch circuits No. 8 and larger.

E. Use conductor not smaller than 12 AWG for power an lighting circuits.

F. Use conductor not smaller than 14 AWG for control circuits.

G. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.

H. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.

I. All conductors size #6 and smaller shall be color coded insulation. Conductors size #4 and larger shall be color code by use of colored plastic tape applied within 6" of each conductor end. All color coding shall be with the same color being used with its respective phase or bus through the entire job as follows:

208/120 Volts	277/480 Volts
Phase A - Black	Phase A - Brown
Phase B - Red	Phase B - Orange
Phase C - Blue	Phase C - Yellow
Neutral - White	Neutral - Gray

Ground - Green Ground - Green

J. Grounding conductors shall be identified with a continuous outer finish that is either green, or green with one or more yellow stripe.

K. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

L. Protect exposed cable from damage.

M. Support cables above accessible ceiling, using spring metal clips or plastic cable ties to support cables from structure. Do not rest cable on ceiling panels.

N. Use suitable cable fittings and connectors.

O. Neatly train and lace wiring inside boxes, equipment, and panelboards.

P. Clean conductor surfaces before installing lugs and connectors.

Q. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

R. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

S. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

T. Terminate spare conductors with electrical tape.

U. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

V. Splice only in accessible junction boxes.

3.05 INTERFACE WITH OTHER PRODUCTS

A. Identify wire and cable under provisions of Section 16195.

B. Identify each conductor with its circuit number or other designation indicated on Drawings.

3.06 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Division 1.

B. Inspect wire and cable for physical damage and proper connection.

C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

D. Verify continuity of each branch circuit conductor.

E. Verify continuity of each control circuit conductor.

F. Verify proper phasing of conductors.

END OF SECTION 16120

SECTION 16130 - BOXES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Wall and ceiling outlet boxes.

B. Floor boxes.

C. Pull and junction boxes.

D. In-ground cast concrete boxes.

1.02 RELATED SECTIONS

A. Section 16010 - Basic Electrical Requirements.

B. Section 16141 - Wiring Devices: Floor Box Service Fittings.

C. Section 16160 - Cabinets and Enclosures.

D. Section 16195 - Electrical Identification.

1.03 REFERENCES

A. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

B. ANSI/NFPA 70 - National Electrical Code.

C. NEMA 250 - Enclosures for Electrical Equipment(1000 Volts Maximum).

1.04 PROJECT CONDITIONS

A. Verify field measurements are as shown on Drawings.

B. Verify locations of floor boxes and outlets to rough-in.

C. Electrical boxes are shown on Drawings in approximate locations unless

dimensioned. Install at location required for box to serve intended purpose.

PART 2 - PRODUCTS

2.01 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
2. Concrete Ceiling Boxes: Concrete type.

B. Cast Boxes: NEMA FB 1, Type FD, cast feralloy deep type. Provide gasketed cover by box manufacturer. Provide threaded hubs.

2.02 FLOOR BOXES

A. Floor Boxes: ANSI/NEMA OS 1, fully adjustable.

B. Material: Cast metal with brass cover plate.

C. Shape: Round or Rectangular.

D. Conform to regulatory requirements for concrete-tight floor boxes.

E. Hubbell: B02436, B4233, and B-4333 Series.

F. Walker: 880CS1, 880CS2, 880CS3.

2.03 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Surface-Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface-mounted junction box.

1. Material: Cast aluminum
2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

C. In-Ground Cast Concrete Box: NEMA 250, Type 6, inside flanged, recessed cover

box for flush mounting:

1. Material: Cast concrete or polymer concrete reinforced.

2. Cover: Nonskid cover with stainless steel cover screws capable of light vehicular traffic.
3. Cover Legend: Electric, telephone, fire alarm CATC, etc.
4. Cut conduit openings using tools and methods recommended by the manufacturer.
5. In-ground pull boxes shall have solid bottoms with weep holes as manufactured by Quazite 'PG' series or approved equal.
6. Substitutions: Under provisions of Division 1.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

B. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

C. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

D. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

E. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods that are U.L. listed and tested.

F. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

G. Use flush mounting outlet boxes in finished areas.

H. Do not install flush mounting boxes back-to-back in walls; provide minimum 12 inch separation. Provide minimum 24 inches separation in acoustic rated walls.

I. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

J. Use stamped steel bridges to fasten flush mounting outlet box between studs.

K. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

L. Use adjustable steel channel fasteners for hung ceiling outlet box.

M. Do not fasten boxes to ceiling support wires.

N. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

O. Use gang box where more than one device is mounted together. Do not use sectional box. Provide barriers to separate different voltage systems.

P. Use gang box with plaster ring for single device outlets.

Q. Use cast outlet box in exterior locations exposed to the weather and wet locations.

R. Set floor boxes level.

S. Large Pull Boxes: Boxes larger than 100 cubic inches (1 600 cubic centimeters) in volume or 12 inches (300 mm) in any dimension.

1. Interior Dry Locations: use hinged enclosure under provisions of Section 16160.
2. Other Locations: Use surface-mounted cast metal box.

T. Identify boxes under provision or Section 16195.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations and sizes of required access doors with General Contractor and other trades

B. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

C. Coordinate mounting heights and locations of outlets mounted above counter, benches and backsplashes.

D. Position outlet boxes to locate luminaires as shown on reflected ceiling plan.

3.03 ADJUSTING

A. Adjust floor box flush with finish flooring material.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knock-out closure in unused box opening.

END OF SECTION 16130

SECTION 16141 - WIRING DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Device plates and decorative box covers.

E. Floor box service fittings.

F. Time switch.

1.02 RELATED SECTIONS

A. Section 16130 - Boxes

1.03 REFERENCES

A. NEMA WD 1 - General Purpose Wiring Devices.

B. NEMA WD 5 - Specific Purpose Wiring Devices.

C. NEMA WD 6 - Wiring Device Configurations.

D. Federal Specification - FS-W-596 Series - general specifications.

E. Federal Specification - FS-W-896 Series - toggle switches.

1.04 SUBMITTALS

A. Submit under provisions of Division 1.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Manufacturer's Instructions:

1. Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements.

PART 2 -PRODUCTS

2.01 WALL SWITCHES

A. Manufacturers:

1. Slater.
2. Hubbell.
3. G.E.
4. Leviton
5. Substitutions: Under provisions of Division 1.

B. Description: NEMA WD 1, heavy-duty AC only general-use snap switch.

C. Device Body: Ivory plastic with toggle handle.

D. Indicator Light: Separate pilot strap; red color lens.

E. Locator Light: Lighted handle type switch; red color handle.

F. Voltage Rating: 120-277 volts, AC.

G. Current Rating: 20 amperes.

H. Motor Rating: Motor rated for fractional horsepower.

I. Motors 1/2 HP and smaller - Provide switch with thermal overloads to match motor nameplate rating, if motor does not have built-in overload protection.

2.02 WALL DIMMERS

A. Manufacturers:

1. Lutron
2. Leviton
3. G.E.
4. Substitutions: Under provisions of Division 1.

B. Description: NEMA WD 1, Type 1 semiconductor dimmer for incandescent lamps.

C. Device Body: Ivory plastic with rotary knob under slider knob.

D. Voltage: 120 volts.

E. Power Rating: Match load shown on Drawings; 1000 watts minimum.

2.03 RECEPTACLES

A. Manufacturers:

1. Slater.
2. Hubbell.
3. G.E.
4. Leviton
5. Substitutions: Under provisions of Division 1.

B. Description: NEMA WD1; heavy-duty hospital grade general-use receptacle.

C. Device Body: Ivory plastic for general use receptacles.

D. Configuration: NEMA WD 6; type as specified and indicated.

E. Convenience Receptacle: Type 5-20R.

F. GFCI Receptacle: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

G. Computer Receptacle: Indicated receptacle shall be red with ivory cover plate.

2.04 WALL PLATES

A. Decorative Cover Plate: Smooth stainless steel.

1. Slater.
2. Hubbell.
3. G.E.
4. Leviton
5. Substitutions: Under provisions of Division 1.

B. Weatherproof Cover Plate: Gasketed cast metal with hinged gasketed device

cover with straight key cylinder lock.

1. Slater.
2. Hubbell.
3. G.E.
4. Substitutions: Under provisions of Division 1.

2.05 FLOOR MOUNTED SERVICE FITTINGS

A. Flush Cover Convenience Receptacle:

1. Walker.
2. Hubbell.
3. Slater.
4. Steel City.
5. Substitutions: Under provisions of Division 1.
6. Material: Brass
7. Configuration: Duplex flap opening.

B. Flush Cover Combination Receptacle:

1. Walker.
2. Hubbell.
3. Slater.
4. Steel City.
5. Substitutions: Under provisions of Division 1.
6. Material: Brass
7. Configuration: Duplex flap opening.

C. Carpet or Tile Trim Ring: Brass

1. Walker.
2. Hubbell.
3. Slater.
4. Steel City.
5. Substitutions: Under provisions of Division 1.

2.06 TIME SWITCHES

A. Manufacturers:

1. Intermatic
2. Paragon
3. Tork.

B. Furnish and install where shown time switches of the astronomic dial for exterior lighting, twenty-four hour or seven day type, powered by a self-starting synchronous motor, capable of being set for different on-off times each day of the week, to an operating accuracy of plus or minus 15 minutes of the desired time and with day omitting device.

C. Time switch contacts shall be capable of switching 40 amperes per pole continuously at rated voltage as indicated and shall have pole and switching arrangement as indicated on the Drawings.

D. Removable on-off trippers shall make possible multiple on-off periods. Separate manual on and off levers shall enable operation by hand without disturbing automatic settings.

E. Enclosure shall be NEMA 1 for indoor flush use and NEMA 3R for outdoor use. NEMA 1 enclosure shall have combination 1/2" - 3/4" knock-outs on bottom and both sides. Provision shall be made for positive padlocking and/or sealing.

F. Terminals shall be capable of receiving up to #8 AWG wire.

G. Spring-driven reserve power shall be provided sufficient to operate the time switch contacts at least 16 hours after power failure. On restoration of power, time switch shall transfer to synchronous motor drive and automatically rewind reserve.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify conditions under provisions of Division 1.

B. Verify outlet boxes are installed at proper height.

C. Verify wall openings are neatly cut and will be completely covered by wall plates.

D. Verify floor boxes are adjusted properly.

E. Verify branch circuit wiring installation is completed, tested, and ready for

connection to wiring devices.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean debris from outlet boxes.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install devices plumb and level.

C. Install switches with OFF position down.

D. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

E. Do not share neutral conductor on load side of dimmers.

F. Install receptacles with grounding pole on bottom

G. Connect wiring device grounding terminal to outlet box with bonding jumper and branch circuit equipment grounding conductor.

H. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

I. Connect wiring devices by wrapping conductor around screw terminal.

J. Use jumbo size plates for outlets installed in masonry walls.

K. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 16130 to obtain mounting heights specified and indicated on Drawings.

B. Install wall switch 48 inches above finished floor.

C. Install convenience receptacle 18 inches above finished floor.

D. Install convenience receptacle 6 inches above backsplash of counter and coordinate with architectural Drawings.

E. Install dimmer 48 inches above finished floor.

F. Install telephones and computer outlet boxes eighteen inches (18") above finished floor.

G. Install telephones and computer outlet boxes six inches (6") above backsplash of counter.

3.05 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCl receptacle device for proper operation.

3.06 ADJUSTING

A. Adjust devices and wall plates to be flush and level

END OF SECTION 16141

SECTION 16160 - CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Hinged cover enclosures.

B. Cabinets.

C. Terminal blocks and accessories.

D. Wiring connectors and connections.

1.02 REFERENCES

A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

B. ANSI/NEMA ICS 1 - Industrial Control and Systems.

C. ANSI/NEMA ICS 4 - Terminal Blocks for Industrial Control Equipment and Systems.

D. ANSI/NEMA ICS 6 - Enclosures for Industrial Control Equipment and Systems.

1.03 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Shop Drawings for Equipment Panels: Include wiring schematic diagram, wiring diagram, outline drawing and construction diagram as described in ANSI/NEMA ICS 1.

PART 2 - PRODUCTS

2.01 HINGED COVER ENCLOSURES

A. Construction: NEMA 250; Type 1 steel.

B. Finish: Manufacturer's standard enamel finish.

C. Covers: Continuous hinge, held closed by flush latch operable by key.

D. Panel for Mounting Terminal Blocks or Electrical Components: 14 gage steel, white enamel finish.

2.02 CABINETS

A. Cabinet Boxes: Galvanized steel with removable endwalls, 24 inches wide, 24 inches high, 6 inches deep minimum. Provide 3/4 inch thick plywood backboard painted matte white, for mounting terminal blocks.

B. Cabinet Fronts: Steel, surface type with screw cover front, concealed hinge and flush lock keyed to match branch circuit panelboard; finish in gray baked enamel.

2.03 TERMINAL BLOCKS AND ACCESSORIES

A. Terminal Blocks: ANSI/NEMA ICS 4; UL listed.

B. Power Terminals: Unit construction type, closed-back type, with tubular pressure screw connectors, rated 600 volts.

C. Signal and Control Terminals: Modular construction type, channel mounted; tubular pressure screw connectors, rated 300 volts.

D. Copper Ground Bar Strip with #6 Copper Grounding: Electrode conductor to building steel.

2.04 MANUFACTURERS

A. Burndy #RK Series.

B. Buss.

C. Belden.

2.05 FABRICATION

A. Shop assemble enclosures and cabinets housing terminal blocks or electrical components in accordance with ANSI/NEMA ICS 6.

B. Provide conduit hubs on enclosures.

C. Provide protective pocket inside front cover with schematic diagram, connection diagram, and layout drawing of control wiring and components within enclosure.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install cabinets and enclosures plumb; anchor securely to wall and structural supports at each corner, minimum.

B. Provide accessory feet for free-standing equipment enclosures.

C. Install trim plumb.

END OF SECTION 16160

SECTION 16195 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Nameplates and tape labels.

B. Wire and cable markers.

C. Conduit system junction box and pull box color coding.

1.02 RELATED WORK

A. Section 09900 - Painting.

1.03 SUBMITTALS

A. Include schedule for nameplates and tape labels.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Nameplates: Engraved three-layer laminated plastic, black letters on a white background.

B. Wire and Cable Markers: Cloth markers, split sleeve or tubing type.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Degrease and clean surfaces to receive nameplates.

B. Install nameplates parallel to equipment lines.

C. Secure nameplates to equipment fronts using screws or rivets. Secure nameplate to inside face of recessed panelboard doors in finished locations.

D. Embossed tape will not be permitted for any application.

3.02 WIRE IDENTIFICATION

A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams or equipment manufacturer's shop drawings for control wiring.

3.03 NAMEPLATE ENGRAVING SCHEDULE

A. Provide nameplates of minimum letter height as scheduled below.

B. Panelboards, Switchboards and Motor Control Centers: 1/4 inch; identify equipment designation. 1/8 inch; identify voltage rating and source.

C. Individual Circuit Breakers, Switches, and Motor Starters In Panelboards, Switchboards, and Motor Control Centers: 1/8 inch; identify circuit and load served, including location.

D. Individual Circuit Breakers, Enclosed Switches, and Motor Starters: 1/8 inch; identify load served.

E. Transformers: 1/4 inch; identify equipment designation. 1/8 inch; identify primary and secondary voltages, primary source, and secondary load and location.

3.04 CONDUIT SYSTEM JUNCTION BOX AND PULL BOX COLOR CODING SCHEDULE

A. Coordinate color paint with Section 09900 - Painting to identifying conduit system junction boxes and pull boxes as scheduled below.

B. Emergency Distribution System: red.

C. 480 Volt, Single and Three Phase System: blue.

D. 208 Volt, Single and Three Phase System: black.

E. Fire Alarm System: Red.

F. Motor and Other Control Systems: purple.

G. Telephone System: yellow.

H. Television System: brown.

I. Security System: white.

END OF SECTION 16195

SECTION 16420 - SERVICE ENTRANCE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Arrangement with Utility Company for permanent electric service including payment of Utility Company charges for service.

1.02 RELATED WORK

A. Division 3: Concrete Work.

1.03 SYSTEM DESCRIPTION

A. System Voltage: 120/2080 volts, three phase, four-wire, 60 Hertz.

1.04 QUALITY ASSURANCE

A. Utility Company: Tampa Electric.

B. Install service entrance in accordance with Utility Company's rules and regulations.

PART 2 - PRODUCTS

2.01 INSTALLATION

A. Make arrangements with Utility Company to obtain permanent electric service to the Project and to maintain existing electrical service.

B. Overhead: Install service entrance conduits and feeders from the transformer location to building service entrance equipment. Coordinate primary conduit routing and installation with Utility Company.

END OF SECTION 16420

SECTION 16440 - DISCONNECT SWITCHES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Disconnect switches.

B. Fuses.

C. Enclosures.

1.02 REFERENCES

A. ANSI/UL 198C - High-Intensity Capacity Fuses; Current Limiting Types.

B. ANSI/UL 198E - Class R. Fuses.

C. FS W-F-870 - Fuseholders (For Plug and Enclosed Cartridge Fuses).

D. FS W-S-865 - Switch, Box, (Enclosed), Surface-Mounted.

E. NEMA KS 1 - Enclosed Switches.

1.03 SUBMITTALS

A. Submit product data under provisions of Division 1.

B. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit.

C. NEMA 250 - Enclosures for Electrical Equipment(1000 Volts Maximum).

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - DISCONNECT SWITCHES

A. Square D.

B. Westinghouse.

C. Challenger.

D. I.T.E.

E. Substitutions: Under provisions of Division 1.

2.02 DISCONNECT SWITCHES

A. Fusible Switch Assemblies: NEMA KS 1; Type HD, FS W-S-865; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: FS W-F-870.

B. Nonfusible Switch Assemblies: NEMA KS 1; Type HD; FS W-S-865; quick-make, quick break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

C. Enclosures: NEMA KS 1; as indicated on Drawings.

2.03 ACCEPTABLE MANUFACTURERS - FUSES

A. Bussman.

B. Gould-Schawmut.

C. Littlefuse Tracor.

2.04 FUSES

A. Fuses 600 Amperes of Less: ANSI/UL 198E, Class J. for feeders and transformer loads and class RK 5 for motor loads. Dual element, current limiting, time delay, one-time fuse, 250 or 600 volt.

B. Interrupting Rating: 200,000 rms amperes.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install disconnect switches where indicated on Drawings.

B. Install fuses in fusible disconnect switches.

END OF SECTION 16440

SECTION 16470 - PANELBOARDS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Distribution panelboards.

B. Lighting and appliance branch circuit panelboards.

1.02 REFERENCES

A. FS W-C-375 - Circuit Breakers, Molded Case, Branch Circuit and Service.

B. FS W-P-115 - Power Distribution Panel.

C. NEMA PB 1 - Panelboards.

D. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

E. NEMA PB 1.2 - Application Guide for Ground-fault Protective Devices for Equipment.

1.03 SUBMITTALS

A. Submit shop Drawings for equipment and component devices under provision of Division 1.

B. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker arrangement and sizes.

1.04 SPARE PARTS

A. Keys: Furnish five (5) each to Owner.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURES - PANELBOARDS

A. Square D.

B. Westinghouse.

C. Challenger.

D. I.T.E.

E. Substitutions: Under provisions of Division 1.

2.02 DISTRIBUTION PANELBOARDS

A. Panelboards: NEMA PB 1; bolted circuit breaker type.

B. Provide cabinet front with concealed trim clamps, and hinged door with flush lock. Finish in manufacturer's standard gray enamel.

C. Provide panelboards with copper bus, ratings as scheduled on Drawings. Provide copper ground bus in all panelboards.

D. Minimum Integrated Short Circuit Rating: As shown on Drawings.

E. Molded Case Circuit Breakers: FS W-C-375; provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

F. Current Limiting Molded Case Circuit Breakers: NEMA AB 1 FS W-C-375; provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let- through current and energy level less than permitted for same size Class RK- 5 fuse.

2.03 BRANCH CIRCUIT PANELBOARDS

A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB 1; bolted circuit breaker type.

B. Enclosure: NEMA PB 1; Type 1 or 3 as shown on Drawings.

C. Cabinet Size: 6 inches deep.

D. Provide flush or surface cabinet front with concealed trim clamps, concealed hinge and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

E. Provide panelboards with copper bus, ratings as scheduled on Drawings. Provide copper ground bus in all panelboards.

F. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical for 240 volt panelboards; 14,000 amperes rms symmetrical for 480 volt panelboards, or as shown on Drawings. These ratings may be lowered by short circuit calculations performed by manufacturer stating actual A.I.C. ratings throughout entire system.

G. Molded Case Circuit Breakers: FS W-C-375; bolt-on type thermal magnetic trip circuit breakers. with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled on Drawings.

H. Current Limiting Molded Case Circuit Breakers: FS W-C-375; provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install panelboards plumb (and flush with wall finishes), in conformance with NEMA PB 1.1.

B. Height: 6 feet 6 inches.

C. Provide filler plates for unused spaces in panelboards.

D. Provide typed circuit directory for each branch circuit panelboard, new or existing. Revise directory to reflect circuiting changes required to balance phase loads. Trace out all circuits in existing panelboards to indicate an accurate directory per new space changes and room numbers.

3.02 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

END OF SECTION 16470

SECTION 16500 - LIGHTING FIXTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Lamps
B. Lighting Fixture Accessories
C. Interior Lighting Fixtures
D. Exterior Lighting Fixtures
E. Emergency Lighting

1.02 SCOPE

A. The general conditions, the supplementary conditions and the applicable requirements of Division 16 shall apply to this section.

B. This section defines the specific requirements for the lighting system and associated hardware.

1.03 RELATED DOCUMENTS

A. Division 1. - General Requirements.
B. Section 16010 - Basic Electrical Requirements.

1.04 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.
B. ANSI A58.1 - Minimum Design Loads for Buildings and Other Structures.
C. ANSI/NFPA 101 - Life Safety Code

1.05 SUBMITTALS

A. Submittal requirements in this section are supplementary to the submittal requirements outlined in Section 16010.

B. Product Data: Submit Manufacturer's technical Product Data and shop drawings assembled in "fixture type" alphabetical order with proposed fixture or equipment clearly indicated. Fill in complete model number including all options ordered with the fixture. Product data shall include conformance to all specifications plus the

following:

1. Ballast information and specifications.
2. Lamp models and specifications.

3. Pole material, finish, specifications, and manufacturers recommended methods of installation.
4. Fixture depth, color, lens, gauge of metal, trim, and method of fabrication.

C. Highlight features of fixture and technical data showing conformance with plans and specifications. Indicate all deviation from plans and specifications.

D. Provide factory certified calculations for all Poles and Pole mounted Luminary combinations for the wind load and gust factor per applicable code. These calculations are to be accepted by the Engineer as complying with the specified requirements for the installation prior to placement of any orders.

E. Submit bound catalog cuts properly highlighted, giving complete description of fixtures to include photometric curves and method of installation within 30 days of award of contract.

F. Maintenance Data: Submit maintenance data and parts list for each interior lighting fixture and accessory; including "trouble shooting" maintenance guide.

1.06 QUALIFICATIONS

A. The lighting fixtures listed in the fixture schedule are the basis of design for the lighting systems. Substitutions will be considered if proposed substitute fixtures are equivalent in all respects. Equivalency of fixtures are determined by Engineer and includes the following data for comparative purposes:

B. Performance.

1. Quality of construction.
2. Design Compatibility.
3. Appearance.
4. Aesthetic considerations for compatibility with the architecture.
5. Distribution.
6. Efficacy.
7. Manufacturer reliability based upon past performances.

C. Certain fixtures may be identified on the fixture schedule by symbol or note as having special design considerations. Requests for consideration of substitutes for these fixtures must be made a minimum of 10 days prior to bid opening. Complete data on each proposed substitute fixture, including catalog cuts and photometric data for both the specified and proposed.

D. Acceptable Manufacturer's: Provide light fixtures manufactured by one of the following:

1. COO per lighting.
2. Genlyte Thomas Group, LLC
3. Holophane
4. Hubbell lighting
5. Those specified in the fixture schedule

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide new light fixtures, supplied in a package from a single manufacturer's representative, in the quantities and types as shown on the plans, listed on the "Fixture Schedule", and specified herein.

B. Fixture catalog numbers do not necessarily include all accessories and are intended to serve as a guide in defining types and manufactures of unit only. In the event conflicts occur on the "Fixture Schedule" between the written description of a fixture and the model number indicated the written description shall precedence.

C. Fixtures shall be complete with but not necessarily limited to lamps, lampholders, reflectors, ballasts, starters, wiring and any other details required for a complete installation. Provide all accessories, mounting hardware, brackets and trim as required for the specific installation.

D. Gasketing material shall be vinyl or other non-aging type material as approved by the Engineer.

E. Verify ceiling system compatibility with recessed fixture mounting before placing order.

F. Where fixture stems are furnished by fixture manufacturer, he/she shall verify length

prior to placement of order or release for shipment. Where fixture stems are furnished by the Electrical Contractor, he/she shall verify length prior to installation.

G. Suspended fixtures shall have swivel type aligned hangers in ceiling outlet boxes to ensure plumb suspension.

2.02 INTERIOR LUMINARIES

A. It shall specifically be the responsibility of the contractor to verify exact type ceiling and recessing depth of all recessed fixtures and to furnish the mounting trims accessories of the specified and/or approved fixtures specifically for the ceiling to be installed, and to match those existing in the affected project space.

B. Fluorescent Troffers:

1. Provide the grade troffers as indicated by "Fixture Schedule" model number or written description.
2. Troffers shall be constructed of code gauge steel (20 gauge min.) with a five stage, iron phosphate pre-treatment and backed white enamel finish.
3. Troffers shall be painted after fabrication.
4. All louvers or lens frames shall be latched by cam-lock or "earth-quake" type latches, spring clips are not acceptable.
5. Provide all four bulb fixtures with 2-2 bulb ballasts unless otherwise specified.
6. Provide three bulb fixtures with 1-1 bulb and 1-2 bulb ballasts unless otherwise noted.
7. All ballasts shall be Electronic type, all bulbs shall be Energy Saving type.

C. Surface Mounted Fluorescent Fixtures: Provide premium specification grade surface mounted fluorescent fixtures constructed of code gauge steel with a five stage, iron phosphate pre-treatment and backed white enamel finish, unless otherwise noted.

D. Recessed Down Lights: Provide premium specification grade recessed light fixtures, complete with trim and rough in frame. Frames shall be constructed of galvanized steel and U.L. listed for direct contact with ceiling insulation. Fixture shall be provided with plaster, gypsum or acoustical tile ceiling trims as required for the installation.

E. Emergency Exit Signs: Provide Architectural Grade exit signs in locations shown on the plan. Sign shall be constructed either single or double sided as required. Fixture shall be universally mountable, either end mounted, top mounted or surface mounted

as required for installation as specified. Letters shall be red LED, unless otherwise specified, and directional arrows shall be produced in the field by removing pre-punched knock-outs. Fixture shall be provided with battery back-up, unless otherwise specified.

F. Emergency Egress Light Fixtures: Provide Commercial Grade emergency egress light fixtures in locations shown on the plan. Fixture shall be constructed of die-formed steel, finished with backed enamel, color as standard by the manufacturer. Lamps shall be sealed-beam in thermoplastic housings with halogen or incandescent lamps as specified. Provide lead calcium battery backup sized for a minimum of 90 minutes of illumination in the event of power failure.

2.03 EXTERIOR LUMINARIES

A. Provide all lamps, accessories, mounting hardware, shielding, brackets, concrete bases and trim as required for the specific installation. Ensure all lighting fixtures mounted outdoors and exposed to the elements are provided with gasketing between the lens door and frame to seal the interior of the fixture from water intrusion.

B. Surface Mounted HID Fixtures: Provide specification grade surface mounted HID, "Wall-Pak" fixtures constructed of die cast aluminum housing with stainless steel external hardware and UV stabilized polycarbonate reflector, color dark bronze unless otherwise specified. Lamp and ballast as specified on fixture schedule.

C. Recessed Down Lights: Provide premium specification grade recessed light fixtures, complete with trim and rough in frame. Frames shall be constructed of galvanized steel and U.L. Listed for direct contact with ceiling insulation and installation in wet locations. Fixture shall be provided with metal soffit, plaster, gypsum or acoustical tile ceiling trims as required for the installation.

2.04 LAMPS

A. General: Provide new lamps in all light fixtures supplied, in the quantities and types as specified on the plans and herein. Lamps shall be installed new, immediately prior to final inspection, and shall not be used for construction. Include in base bid, 10% additional lamps (but not less than 2) as spare to be provided to the Owner at the completion of the project.

B. Acceptable Manufacturer: Subject to compliance with the requirements established in this specification, lamps by one of the following Manufacturer's may be incorporated in this work:

1. Osram Sylvania, Inc.
2. Philips Lighting Company.
3. General Electric, Inc.
4. Panasonic Lighting Products.

C. Fluorescent Lamps: All T8 lamps shall be 4100 Kelvin color temperature with a Color Rendering Index (CRI) of 80.

D. Compact Fluorescent Lamps: All compact fluorescent lamps shall be 4100 Kelvin color temperature with a Color Rendering Index (CRI) of 80.

E. Metal Halide Lamps: Provide new metal halide lamps in all locations where specified on fixtures to be installed. Lamp wattage, size and base configuration to be coordinate with fixture to be installed. Lamps shall have a Color Rendering Index (CRI) of 70 and a 4000 Kelvin color temperature.

2.05 BALLASTS

A. Acceptable Manufacturers: Subject to compliance with the requirements established in this specification, ballasts by one of the following Manufacturer's may be incorporated in this work:

1. Philips Lighting Company.
2. Advance Transformer Co.
3. Magne Tek, Inc.
4. Osram Sylvania, Inc.

B. General: Provide new ballasts in all light fixtures supplied, in the quantities and types as specified on the plans and herein. Ballasts shall be factory installed in new fixtures and shall not be used for construction.

C. Interior ballasts: Provide ballasts to function without interruptions when operating in a room ambient temperatures of 80 deg F with a plenum ambient temperature of 110 deg F.

D. Provide electronic ballasts in all fluorescent light fixtures as specified. Fluorescent Lamp Electronic Ballasts shall meet the requirements of the following as a minimum:

E. Exterior Ballasts: Provide ballasts to function without interruptions when operating in "Cold Weather Conditions" ambient temperatures from -20 deg F to 150 deg F.

1. Metal Halide Ballasts: Provide peak-lead autotransformer type, high power factor ballasts provide multi-tap primary voltage ballasts, one of the tap ratings shall comply with the voltage as specified on the light fixture schedule.

PART 3 - EXECUTION

3.01 GENERAL

A. Inspection: Installing contractor shall examine areas and conditions where light fixtures are to be installed, and notify the General Contractor in writing, of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

B. Locations: Install light fixtures where shown, in accordance with the manufacturer's written instructions and recognized industry practices. Ensure that manufacturer's requirements for clearances do not conflict with site conditions that would hamper serviceability, illumination, and sound attenuation.

C. Temporary Closure: Upon completion of installation, provide protective covering on all exposed fixture surfaces to prevent entrance of dust and debris onto light fixtures. In locations where work is being accomplished by other trades, maintain a protective covering over fixtures mounted outside or inside, to prevent deterioration of factory finish. Should the installed unit be exposed to paint over spray, roofing adhesives, dirt, concrete or any other form of foreign surface cover, this contractor shall remove the foreign surface covering at his cost without deteriorating the factory finish on the unit.

D. Grounding: Provide separate #12 Awg, copper ground conductor in all conduits for lighting circuits. Ground conductor shall be secured to each fixture body by means of a bonding screw. Metal conduit shall not be an acceptable ground connection on either interior or exterior installations.

3.02 INSTALLATION OF INTERIOR FIXTURES:

A. A recessed fixtures in removable ceilings shall be connected to the branch circuit with 1/2" minimum flexible conduit and branch circuit wire no smaller than No. 12 from an accessible junction box. Where fluorescent fixture housings are connected together, use 90 deg. C wire for branch circuit feed through fixture channels. All flex fittings shall be steel set screw type with insulated throats.

B. Surface Mounted: Ceiling mounted fluorescent fixtures shall be properly and carefully supported and aligned. Furnish and install all necessary steel shapes, etc., for support of fixtures as required and/or detailed on the drawings. Lighting fixtures shall be clean and lamped with new lamps at the time of final inspection, unless otherwise indicated on the drawings.

C. Flush Mounted: All fixtures in plaster ceilings shall be installed with a plaster frame. Unless otherwise noted, mounting height for fixtures are from the finished floor to the bottom of the fixture for pendent mounted fixtures, and to the bottom of the outlet box or recessed back box for wall mounted fixtures.

D. Fixtures shall be grounded. Lamp sockets shall be wired so that the outer shell is connected to the neutral grounded conductor.

E. Fixtures recessed in furred ceiling shall be installed so that they can be removed from below the ceiling.

F. Fixtures installed in plastered or acoustical tile shall not be supported directly from the ceiling. Support fixtures from metal bar hangers or Unistrut channels attached to the structure.

3.03 INSTALLATION OF EXTERIOR FIXTURES

A. Wall Mounted Fixtures: Install wall mounted light fixtures in accordance with manufacturer's instructions. After electrical connections are made and tested, set fixture in bed of one-part polyurethane calk to ensure weather tight installation. Fillet all joints around fixture to provide a clean appearance and quality installation. Ensure that exterior fixtures are weather tight.

B. Wiring: All conduit entering light fixtures from under ground shall be sealed using ducseal or equivalent.

END OF SECTION 16500

SECTION 16620 - STANDBY SYSTEM

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 Work of this section.

1.02 SCOPE OF PROJECT

A. Contractor shall be responsible for any and all foundations, pads, conduits, etc., as may be required to accommodate a complete installation for all components required by this scope.

B. Provide a code compliant NEC 702 Optional Standby System.

1.03 INTENT OF SPECIFICATIONS

A. All materials, equipment, and parts comprising the unit specified herein shall be new and unused, of current nature and of highest grade.

B. The engine, generator, and all major items of auxiliary equipment shall be manufactured in the U.S. by manufacturers currently engaged in the production of such equipment. The unit shall be shipped to the job site by an authorized dealer having a parts and service facility within a fifty (50) mile radius of the job site. In addition, and in order not to penalize the owner for unnecessary or prolonged periods of time for service or repairs to the emergency system, the bidding generator set supplier must have no less than sixty (60) percent of all engine replacement parts in its stock at all times. Certified proof of this requirement shall be available from the dealer and a personal inspection of the dealer's facilities may be made by the designing engineer or his appointed representative to substantiate claims made by the generator set supplier.

C. The standby generator system shall be furnished complete with all materials, apparatus, equipment, components, accessories, fuel, exhaust, and cooling systems to provide a complete and operable generating system.

D. The complete engine-generator package shall be the sole responsibility of the generator manufacturer and shall be specifically designed, assembled, and factory tested to assure that such conditions as short circuits and load surges due to motor starting, SCR controllers and over speed, high temperature,

overload, and adverse environmental conditions are not likely to render the emergency standby system inoperative.

E. The engine-generator package shall be a current production model of a manufacturer regularly engaged in the production of engine-driven generator units for a period of twenty-five (25) years or more.

F. The specified standby KW-typical shall be for continuous electrical service during interruption of the normal utility source.

1.04 SPECIFICATIONS AND DRAWINGS

A. Furnish information showing manufacturer's model numbers, dimensions, and weights for the engine, generator, and major auxiliary equipment. Proposed deviations from the specifications shall be stated in the bid. The successful bidder shall submit copies of the following:

1. Engine generator set, including plans and elevations or riser views clearly Indicating entrance points for each of the interconnections required.
2. Engine generator/exciter control cubicle/sound attenuating enclosure.
3. Ventilation and combustion CFM requirements.
4. Exhaust mufflers and vibration isolators.
5. Battery charger, battery, and battery racks.
6. Fuel connection points.
7. Automatic load transfer switch.
8. Actual electrical diagrams, including schematic diagrams, and interconnection wiring diagrams for all equipment to be furnished.
9. Legend for all devices on all diagrams.
10. Sequence of operation explanations for all portions of all schematic wiring diagrams.
11. Block Heater.

1.05 FACTORY TESTS

A. A certified prototype test certificate shall be furnished at the time of bid, and a certified prototype test supported seal shall be furnished on the generating unit shipped to the job site. The power system consisting of the prime mover, generator, and transfer switches must be tested as a complete system, on a representative engineering type model. The test being potentially damaging to the equipment tested must not be performed on equipment sold.

B. This prototype test certificate shall assure the owner that the prime mover and generator has reserve capacity beyond design so that surges and transistor overloads are not likely to damage the generator set. The generator, exciter, and voltage regulator characteristics must be matched to the torque curve of the prime mover. Acceptable evidence of this, on the unit delivered to the job site, must undergo the following tests:

Calculations must demonstrate that the exciter and voltage regulator will permit utilization of at least eight (80) percent of maximum available prime mover torque at all speeds between fifty (50) percent of rated speed and, with rated load connected to its terminals, will provide fast and positive recovery from transient disturbance.

1. With generator set operating at rated speed, voltage, and load, reduce speed to half rated by manually overriding the governor control. Generator set must recover to full speed with rated load connected when the governor control is returned to its normal mode.

C. Determine by using individual thermocouple measurements that all electrical and mechanical components are free of internal hot spots that would result in premature failure of the generator set. Complete thermal evaluation of all electrical parts must include actual measurements by thermocouples of all internal generator and exciter hot spot temperatures. The position measured any place in the windings must exceed the temperature rise limits of NEMA for the particular type of insulation system used (Class F). Temperature rise measurements by resistance is not acceptable.

D. Establish short circuit capability. The generator must withstand without damage ten (10) short circuits, each of thirty (30) seconds duration. The short-circuit tests shall be applied across all phases when generator is operating at rated voltage, amperage, power factor, and speed. When short circuits are cleared, the generator must build up voltage and perform normally without manual intervention, such as resetting breakers or other tripping devices. After test disassembly and inspection, generator must not show any electrical or mechanical damage to any system component.

E. Demonstrate the capability of the generator set, its vital controls and accessories to function reliably and compatibly when in service demands are made by disturbance commonly occurring in actual load circuits, such a surges caused by motor starting, elevator operation, rectifiers, SCR controllers, X-ray equipment, and reactive discharges.

F. Discover by endurance testing that there are no resonance conditions in the generator set or its accessories that will cause premature fatigue failures of components on production units.

G. Prove a margin of safety, in actual trials, between the generator set and its protective system so that the generator set is not weakened or damaged before the protective system would shut down.

H. Verify that production generator set will perform to specifications under all extremes of environment expected in actual service by factory load test at rated power factor and furnish notarized copy of test report.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than one hour normal travel time fron Installer's place of business to Project site.
2. Engineering Responsibility: Preparation of data for vibration isolators and seismic restraints of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 40 miles of Project site, a service center capable of providing training, parts and emergency maintenance repairs.

C. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing Association or is a nationally recognized testing laboratory (NRTL) and that is aacceptable to authorities having jurisdiction.

1. Testing Agency'[s Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

D. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

E. Electrical Components, Devices and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

F. Comply with ASME B15.1.
G. Comply with NFPA 37.

H. Comply with NFPA 70.

I. Comply with NFPA 110.

J. Comply with UL 2200.

K. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

PART 2 - MATERIALS

2.01 ENGINE GENERATOR

A. Furnish and install standby generator with alternator sized to maintain a fifteen (15) percent instantaneous voltage dip at starting. Basis of design-Generac Model SG100-A1 6 6.8-N-18-E-B-S-Y-C System to include the following:

1. The engine shall be Ford V-10 417 cubic inch Generac displacement or approved equal.
2. The emergency generator system consisting of a natural gas fueled engine directly coupled to A/C generator shall provide fully automatic operation so that unit takes full load within seven (7) seconds in the event of commercial power failure.
3. Cooling system: Engine-driven radiator fan. Radiator rated for an ambient of 105^{o}F. Unit shall have a self-sealing pre-lubricated coolant pump, blower fan, thermostat controlled, low water level shutdown in the event of water loss and high coolant shutdown controlled at generator panel. Furnish low water temperature contact.
4. Fuel system shall have down-draft carburetor, dry-element air cleaners, and automatic choke.
5. Fuel shall be natural gas (flexible fuel lines).
6. Governor: Electronic Isochronous governor, shall maintain frequency regulation at ± 0.25 percent steady state from no load to fill rated load.
7. Lubrication system: Positive displacement, gear design, lube oil pump, full pressure lube to all bearings, full flow oil filters, oil level indicator, oil pressure gauge, low oil pressure shutdown, filters, and lube oil cooler.
8. Starting system: Remote twelve (12) or twenty-four (24) volt, two (2) wire negative ground starting system, positive shift, gear-engaging starter, and crank limiter. Cranking controller located in generator/engine control panel.
9. Valves: Heat and corrosion-resistant alloy, steel valve fitting, and valve seat inserts.
10. The engine and generator shall be painted in accordance with engine supplier's standard colors. Paints shall be lead-free; provide weather-protected sound attenuating enclosure.
11. A unit mounted thermal circulation type water heater incorporating a thermostatic switch shall be furnished to maintain jacket water to 70^{o}F. The

heater shall be 120-volt single phase, sixty (60) Hertz. The unit shall be complete with contactor and thermostat.

12. Engine instrument panel: To include water temperature gauge, oil pressure gauge and alternator ammeter.
13. Safety Shutdown Contactors: Provide and wire to a common junction box on engine, a set of sensors each for low oil pressure, high jacket water temperature, low coolant level, over speed, low water level and overcrank.
14. Steel base: A structural steel subbase common to engine and generator shall rigidly maintain alignment during static and running operation.
15. Vibration isolators recommended by generator supplier shall be installed between the frame and engine.
16. Weather proof sound attenuated enclosure with vertical intake and discharge cooling air.

2.02 VOLTAGE

120/240 volt, single-phase, three (3) wire

2.03 GENERATOR

A. One hundred (100) KW natural gas, with alternator sized to maintain fifteen (15) percent instantaneous voltage dip at starting (80 SKVA).

B. Provide a single-bearing type generator close coupled to the engine flywheel housing of the rating herein specified. The temperature rise at this rating shall not exceed 130°C above an ambient of 40°C.

C. Generator shall be self-ventilated, drip proof, rotating field, brushless exciter, and the synchronous type.

D. Other characteristics include:

1. Voltage regulator $\pm$ 2 percent no load to full load.
2. Voltage adjustment rheostat.
3. Designed for "SCR" loads.
4. Permanent magnet excitation.

E. Battery system: Engine equipped with a set of lead-acid batteries rated 135 ampere hour at twelve (12) or twenty-four (24) volts. Furnish a battery rack, battery cable, and acid. Furnish automatic battery charger, current limiting type, complete with ammeter, voltmeter, malfunction contact, 120 volt, AC single-phase input (with cord and plug), and ten (10) ampere DC output. Charger mounted within the generator enclosure.

F. Generator control panel: Shall be an electronic modulator microprocessor, wall-mounted type, and shall contain:

1. Two (2) main line circuit breakers (400 AF; 400 A.T.).
2. One (1) voltmeter, 0.5 percent.
3. One (1) ammeter, 0.5 percent.
4. One (1) frequency meter, dial type, 0.3 percent.
5. One (1) set of automatic engine start-stop controls, single-crank duration, HOA selector switch, safety shutdown for LOP-HWT-OS-OC, pilot light for each safety shutdown condition, and mounting of governor raise-lower switch. Furnish dry set of contacts to close if HOA selector switch is in the "off" position for alarm and dry set of safety shutdown contacts for remote annunciation, push to test light push button.
6. One (1) running hour meter.
7. One (1) set of dry contacts for annunciation of all alarms at the remote generator annunciator panel.

G. Exhaust silencer: Furnish critical silencer complete with companion flanges and arranged for end-in/side-out of exhaust gases. Furnish a stainless steel flexible exhaust connector as recommended by the engine manufacturer.

H. Provide remote emergency-stop push button within main electrical room. Provide all wiring and conduit.

2.04 REMOTE GENERATOR PANEL

A. Remote generator annunciator panel shall be provided for remote mounting to give audible and visual warning of fault or alarm conditions of generator set. The panel shall conform with the requirement of the National Electrical Code and the National Fire Protection Association publication NFPA-110 and shall contain, but not be limited to the following:

1. Alarm horn with silence switch and recurring alarm circuitry.
2. Low oil pressure - red lens.
3. High water temperature - red lens.
4. Over speed - red lens.
5. Over crank - red lens.
6. Loss of engine coolant - red lens.
7. Approaching low oil pressure - amber lens.
8. Approaching high water temperature - amber lens.
9. Low water temperature - amber lens.
10. Battery charger voltage - amber lens.
11. Low battery voltage - amber lens.
12. Control switch not in automatic - red lens.
13. Generator main open - red lens.

14. Generator main closed - green lens.
15. Generator running - green lens.
16. Remote start/stop switch (without load transfer to generator).
17. Power failure simulate test switch (with load transfer to generator).
18. Emergency stop, red "mushroom" type push button.

B. All lamps shall be wired to a press-to-test button and shall light and flash on a fault or an alarm condition. Engraved, three (3) ply phenolic nameplates mounted on screw-on type rails for uniformity shall identify each function

indicated without abbreviation of function description. The face of the panel shall be constructed of stainless steel.

C. The annunciator panel shall be mounted and wired by the installing contractor in an area designated by the Fire Marshall.

2.05 AUTOMATIC TRANSFER SWITCH

A. Automatic transfer switch (ATS) shall be sized as necessary for each standby generator and as manufactured by Zenith furnished in NEMA 1 enclosure. The switch shall be mechanically held and solenoid operated by a solenoid mechanism energized from the source to which the load is to be transferred. Switches manufactured by Generac, Cummins, Kohler, Russell Electric and ASCO are acceptable.

B. Main contacts shall be of silver composition and be protected by arcing contacts. Operating transfer time in either direction shall not exceed ¼ of a second, including relay response.

C. The ATS shall be furnished with the following accessories mounted and wired:

1. Close differential-sensing relays, factory set to drop out at eighty-five (85) percent of nominal and to pick up at ninety-five (95) percent. Voltage and frequency-sensing relay on the emergency source and normal source.
2. Time delay to override momentary outages, adjustable 0.5 to six (6) seconds, set at one (1) second. Provide a digital readout type.
3. Retransfer to normal time delay, adjustable zero (0) to thirty (30) minutes, set at thirty (30) minutes via synchronizing relays. Provide a digital readout type.
4. Adjustable time delay on engine stop after retransfer, zero (0) to five (5) minutes, set at five (5) minutes. Provide a digital readout type.
5. Transfer to emergency time delay, adjustable zero (0) to one (1) minute, factory set at zero (0) minutes.
6. A contact that closes when normal source fails, gold plated for use in engine start circuit.

7. A contact that operates when normal source fails, gold plated for use in engine battery circuit.
8. Test switch to simulate normal source failure.
9. An auxiliary contact on the transfer switch which is closed when the switch is on normal.
10. An auxiliary contact on the transfer switch which is open when the switch is on normal.
11. Normal and emergency pilot lights with green and red lenses, respectively.
12. In-phase monitor.
13. Exerciser with and without load to automatically start and run the generator weekly as set.

2.06 NATURAL GAS FUEL

Coordinate with owner's natural gas supplier for a complete installation of natural gas supply to the unit.

2.07 OUTDOOR WEATHER-PROTECTIVE SOUND ATTENUATED ENCLOSURE

A. Generator set housing shall be provided factory-assembled to generator set base and radiator cowling. Housing shall provide ample airflow for generator set operation at rated load in the ambient conditions vertical discharge of cooling air. The generator shall be bolted to slab and grounded to electrical system. The housing shall have hinged side-access doors and rear control door. All doors shall be lockable. All sheetmetal shall be primed for corrosion protection and finish painted with the manufacturers standard color using a two step electro-coating paint process, or equal meeting the performance requirements specified below. All surfaces of all metal parts shall be primed and painted. The painting process shall result in a coating which meets the following requirements:

Primer thickness, 0.5-2.0 mils. Top coat thickness, 0.8-1.2 mils.
Gloss, per ASTM D523-89, 80% plus or minus 5%. Gloss retention after one year shall exceed 50%.
Crosshatch adhesion, per ASTM D3359-93, 4B-5B.
Impact resistance, per ASTM D2794-93, 120-160 inch-pounds.
Salt Spray, per ASTM Bl17-90, 1000+ hours.
Humidity, per ASTM D2247-92, 1000+ hours.
Water Soak, per ASTM D2247-92, 1000+ hours.

B. Painting of hoses, clamps, wiring harnesses and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant and designed to minimize marring of the painted surface when removed for normal installation or service work.

PART 3 - EXECUTION

3.01 WARRANTY AND TESTS

A. Equipment and installation furnished shall be guaranteed against defective parts of workmanship under terms of the manufacturer's and dealer's standard warranties. In no event shall it be for a period of less than two (2) years from the date of acceptance. Warranty to include full parts and labor during this period without cost to initial user.

B. The electric set shall be manufacturer's standard testing. Prior to acceptance of the installation, equipment shall be tested to show it will start automatically, subjected to full load test shutdown and reset as required in these specifications. Furnish 80 KW, unity power factor, load bank test on generator system for final acceptance. Duration of test shall be two (2) hours.

3.02 START-UP AND INSTRUCTIONS

A. On completion of the installation, the initial start-up shall be performed by a factory-trained service representative of the engine supplier. At the time of the start-up, operating instruction and maintenance procedures shall be thoroughly explained to building operating personnel. Two (2) copies of operating and maintenance instruction books shall be supplied. Provide software to interface with generator control panel.

B. Service representative shall demonstrate and test the ability of the engine controls to automatically shut off the engine for hot water temperature, low oil pressure, over speed, and over crank.

C. A trained service representative shall perform all start-up tests. Include eight (8) hours of factory service for start-up in bid price.

3.03 SYSTEM SERVICE CONTRACT

A. A supplier of the standby power system must provide a copy and make available to the owner its standard service contract and extended warranty, which at the owner's option, may be accepted or refused. This contract can accompany documents, drawings, etc. submitted for approval. The contract shall be for the complete services rendered over a period of two (2) years.

END OF SECTION 16620

speed, and over crank.

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END OF SECTION 16620

SECTION 16721 - FIRE ALARM AND SMOKE DETECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Fire alarm and smoke detection systems.

1.02 RELATED SECTIONS

A. Section 16120 - Wire and Cable.

B. Section 16130 - Boxes.

C. Section 16195 - Electrical Identification.

1.03 REFERENCES AND STANDARDS

A. NFPA 70 - National Electrical Code.

B. NFPA 72 - Standard for the Installation, Maintenance, and Use of Protective Signaling Systems.

C. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilation Systems.

D. NFPA 96 Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

E. FBC - Florida Building Code 2001 and all Amendments (ADA).

F. NFPA 101 - Life Safety Code.

G. NEC Article 760 - Fire Protective Signaling Systems.

1.04 REGULATORY REQUIREMENTS

A. System: UL listed System and Components.

B. State and local ordinance requirements as approved by Authority Having Jurisdiction (AHJ).

C. State Fire Marshall Rule 4A-48.

1.05 SYSTEM DESCRIPTION

A. Prior to submitting a bid for this project all suppliers and installers must contact Woody Woods at Pasco County Facilities Management, (727) 834-3295, to determine exact system requirements. The fire alarm system must be compatible with a Central Station Monitoring Company. All items necessary to comply with Pasco County requirements and to provide a fully functioning system shall be included in the bid price whether shown or not on the drawings or specified in the contract documents.

B. Furnish, install, and place in operating condition an electronically operated fire alarm system as described herein and shown in the plans. All units on the fire alarm system shall be listed by Underwriters' Laboratories, Inc. for fire alarm and security use, and the control panel shall bear the UL label. The system shall be installed in accordance with requirements set by National Electrical Code and in compliance with applicable provisions of NFPA 72 published by the National Fire Protection Association (NFPA).

C. Fire Alarm: The system shall be a microprocessor based point annunciated fire alarm system with walk-through test capability. The control panel and each individual component used in conjunction with the system shall be UL listed for its use. The system shall be totally supervised with a dynamic LCD display. The control panel shall also be able to monitor and receive digital signals from smoke and duct smoke detectors which indicate obscuration rate and set detector sensitivity. Alarm signal shall have sufficient sound levels to comply with applicable codes and regulation. The input power shall be 120 volts, A/C 60 Hz connected on the line side on the main disconnect and individually fused per NEC Article 760 of NFPA Standard. The operating power shall be single power source of 24 volts D.C. and filtered and regulated within 110% of the normal rating. Total power supply capacity shall be 50% greater than the total alarm load. The control panel shall be supervised on the input power line with automatic switch over to battery backup. The battery backup supply shall be capable of powering the system for at least twenty-four (24) hours and still be capable of energizing all signal devices for a period of at least five minutes.

D. System's Connection: The control panel shall be capable and wired so that any one or multiples of fire alarm devices, upon activation, shall sound alarm throughout the entire facility.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in smoke detection and fire alarm systems with five (5) years documented experience.

B. Installer: Company specializing in smoke detection and fire alarm systems with five (5) years experience, certified by Florida State Licensing Board as fire alarm and security system installing contractor.

1.07 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1.

B. Provide wiring diagrams, point to point with voltage drop calculations, data sheets, and equipment ratings, layout, dimensions, finishes, and battery calculations.

C. Submit manufacturer's installation instructions under provisions of Division 1.

D. Submit manufacturer's certificate under provisions of Division 1 that system meets or exceeds specified requirements, certification per NFPA 72.

E. Provide training for two (2) people on the operation, maintenance and repair of the system at the Contractor's expense. Training shall be certified by the manufacturer and be at different times for each person. Include transportation, room and board where needed.

1.08 PROJECT RECORD DRAWINGS

A. Submit documents under the provisions of Division 1.

B. Include location of end-of-line devices.

1.09 OPERATION AND MAINTENANCE DATA

A. Submit data under provisions of Division 1.

B. Include operating instructions, and maintenance and repair procedures, with parts list. Three (3) copies of complete troubleshooting and repair manuals. Provide software and laptop to access programming.

C. Include manufacturer representative's letter stating that system is operational.

D. Maintain system for a minimum of one (1) year, after complete acceptance by the Owner, in accordance with NFPA 72 and 72E.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Store and protect products under provisions of Division 1.

1.11 EXTRA MATERIALS

A. Provide spare parts under provisions of Division 1.

PART 2 - PRODUCTS

2.01 FIRE ALARM CONTROL PANEL (FACP)

A. Control panel construction shall be modular with solid state, microprocessor based electronics. It shall display only those primary controls and displays essential to operation during a fire alarm condition. Keyboards or keypads shall not be required to operate the system during fire alarm conditions. A local audible device shall sound during alarm, trouble or supervisory conditions. This audible device shall sound differently during each condition to distinguish one condition from another without having to view the panel. This audible device shall also sound during each keypress to provide an audible feedback to ensure that the key has been pressed properly.

B. The following primary controls shall be visible through a front access panel:

Character liquid crystal display.
Individual red system alarm LED.
Individual yellow supervisory service LED.
Individual yellow trouble LED.
Green "power on" LED.
Alarm acknowledge key.
Supervisory acknowledge key.
Trouble acknowledge key.
Alarm silence key.
System reset key.

C. The control shall provide the following:

Setting of time and date.
LED testing.
Alarm, trouble, and abnormal condition listing.
Enabling and disabling of each monitor point separately.
Activation and deactivation of each control point separately.
Changing operator access levels.

Walk test enable.
Running diagnostic functions.

Displaying software revision level.
Displaying historical logs.
Displaying card status.
Point listing.
Monitoring detector obscuration rate.
Setting of detector sensitivity.

D. For maintenance purposes, the following lists shall be available from the point lists menu.

All points listed by address.
Monitor point list.
Signal/speaker list.
Auxiliary control list.
Feedback point list.
Pseudo point list.
LED/switch status list.
Horn silence switch.
AHU shutdown override switch.

2.02 GENERAL

A. Provide a complete operable and functional fire alarm system. In the event an item or detail has been omitted from the fire alarm drawings or specifications it is the responsibility of the supplier and contractor to supply and install that item, at no charge to the owner, in order to provide at completion a fully functioning system. No additional charges will be approved.

B. The fire alarm communicator shall be Silent Knight, Model 5104B, or approved equal. In the event that a specific item such as a miscellaneous module is necessary to complete the system then the contractor shall include the item in this bid. Prior to submitting a bid, the supplier/installer shall verify with Pasco County the specified system is in full compliance with Pasco County Requirements.

C. Acceptable manufacturers include: Firelite, Silent Knight, Detection Systems, ADEMCO, Wheelock or equal.

2.03 DEVICES AND ACCESSORIES

A. All devices on system shall be addressable. Addressable shall be defined as a smart device that is assigned an address in plain language for monitoring on the LCD and printer tapes and is field programmable by the Owner. All addressable devices shall have the capability of being disabled or enabled individually.

Systems that require factory reprogramming to add or delete devices are unacceptable.

B. Should a device fail, it will not hinder the operation of other system devices.

C. All devices on system shall be supervised. A supervised system shall detect troubles in panel or wiring, removal or tampering of point devices, monitor either open or closed circuits, and verifies system integrity.

D. The communication format must be a completely digital poll/response protocol to allow t-tapping of the circuit wiring. A high degree of communication reliability must be obtained by using parity data bit error checking routines for address codes and check sum routines for the data transmission portion of the protocol.

E. Each addressable device must be uniquely identified by an address code entered on each device at time of installation. The use of jumpers to set address will not be acceptable due to the potential of vibration and poor contact. Device identification schemes that do not use uniquely set addresses but rely on electrical position along the communication channel are unacceptable. These systems cannot accommodate t-tapping and the addition of an addressable device between existing devices requires reprogramming all existing electrically further devices. The system must verify that proper type device is in place and matches the desired software configuration.

F. All addressable smoke and heat detector heads as specified below will be pluggable into their bases. The bases will contain electronics that communicate the detector status (normal, alarm trouble) to the control panel over two (2) wires. The same two (2) wires shall also provide power to the base and detector. Different detectors heads (smoke or heat) must be interchangeable. Upon removal of the head, a trouble signal will be transmitted to the control panel.

G. True Alarm Photoelectric Detector Head: The photoelectric type detector shall be a plug-in unit which mounts to a twist-lock base and shall be UL approved. Detector to provide an digital signal to the panel for monitoring of obscuration rate and maintenance of constant detector sensitivity.

H. To minimize nuisance alarm, voltage and RF transient suppression techniques shall be employed as-well-as a smoke verification circuit and an insect screen. The detector design shall provide full solid-state construction and compatibility with other normally open fire alarm detection loop devices (heat detectors, pull stations, etc.). The detector head shall be easily disassembled to facilitate cleaning.

I. The detectors shall be of the solid state photoelectric type and shall contain no radioactive material. They will use a pulsed infrared LED light source and be sealed against rear air flow entry.

J. The detector shall fit into a verifiable type base that is common with both the heat detector and ionization type detector and shall be compatible with other addressable detectors, addressable manual stations and addressable zone adapter modules on the same circuit. The detector shall also fit into a non-addressable base that is capable of being monitored by an addressable zone adapter module.

K. There shall be no limit to the number of detectors or zone adapter modules which may be activated or in alarm simultaneously. The operating voltage shall be 24 VDC and operate on a supervised loop.

L. The control panel shall maintain a moving average of the sensors smoke chamber value to automatically compensate for duct and dirty conditions that could affect detection operations. The adjustable level shall be between 0.5% and 4.0% smoke obscuration.

M. The system shall automatically indicate when an individual sensor needs cleaning. When a sensor's average value reaches a predetermined value, a "DIRTY SENSOR" trouble condition shall be audibly and visually indicated at the control panel. Additionally, the LED on the sensor base shall glow steady. If a "DIRTY SENSOR" is further contaminated, an 'EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control panel.

N. The control panel shall continuously perform an automatic self test routine on each sensor to ensure the accuracy of the values being transmitted to the control panel by the sensor. Any problem with the self test shall be indicated by a 'SELF TEST ABNORMAL" trouble condition at the panel.

O. Each sensor shall be capable of being individually set for percent smoke, time of day for percent, and multiple threshold settings.

P. If the proposed system does not have the capabilities of the sections A through E, a maintenance and testing service providing the following shall be included in the base bid:

1. Biannual sensitivity reading and logging for each sensor. This is to be accomplished by the use of a UL listed sensitivity calibration device per the requirement of NFPA 72.

2. Scheduled biannual threshold adjustments on all detectors.

3. Scheduled biannual cleaning of all detectors.

4. Written documentation of all testing, cleaning, replacing, threshold adjustment and sensitivity reading for each smoke detector connected to the system.
5. The inspections and tests, etc., of paragraphs 1 through 4 shall be for a period of five (5) years from the day of final acceptance of the fire alarm system.

Q. Addressable Pull Stations: Addressable pull stations will contain electronics that communicate the station's status (alarm, normal) to the transponder over two (2) wires which also provide power to the pull stations. The address will be set on the raised white lettering and a smooth high gloss finish. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common to all system locks. Pull stations will be normally open, single action manual stations.

R. The front of the station is to be hinged to a backplate assembly and must be opened with a key to reset the station. The key shall be common with the control panels. Stations which use allen wrenches or special tools to reset will not be accepted.

S. The addressable manual station shall be capable of field programming of its "address" location on all addressable initiating circuits. The manual station shall be fitted with screw terminals for field wire attachment. There shall be no limit to the number of stations, detectors, or zone adapter modules, which may be activated or in alarm simultaneously

T. Duct smoke detector: Sensors shall employ True Alarm technology. Photoelectric-type, duct mounted smoke detectors shall utilize all solid state components operating on the light scatter principle, and shall be factory set to detect smoke at a nominal 2 percent light obscuration per foot. Detector shall contain an integrally mounted LED pilot lamp that indicates detector status and shall be equipped with alarm, trouble and auxiliary contacts.

U. Automatic heat sensor: Sensors shall employ TrueAlarm technology. Device shall be combination rate-of-rise/fixed temperature sensor of which both operations are self-restoring. The temperature shall be field selectable.

V. Horns: The horns shall be polarized and shall be operated by 24 VDC. Each horn assembly shall include separate wire leads for in/out wiring for each leg of the associated signal circuit. T-tapping of signal device conductors to signal circuit conductors shall not be accepted. The white lexan lens shall have the word "Fire" in red lettering on the sides and shall be pyramidal in shape to allow for side viewing. All outdoor alarm signals shall be horn only, mounted a minimum of 8' above grade in a weatherproof box.

Minimum dB: 87 dB at 10 feet not to exceed 120 dba.

W. Visual Flashing Lamps (Xenon Strobe): Visual indicating appliances shall be comprised of xenon flashtube and be entirely solid state. These devices shall be UL listed and be capable of either ceiling or wall mounting. The lexan lens shall be pyramidal in shape to allow better visibility. Separate alarm indicating circuits shall be provided for strobes. The maximum strobe pulse duration shall be 0.2 seconds with a maximum duty cycle of 40 percent. The intensity shall be a minimum 75 candela and the flash rate shall be at least 1 Hz but not to exceed 3 Hz. All visual alarms shall be mounted 80 inches above the finished floor, or six inches below the ceiling, whichever is lower.

X. Combination Alarm Unit: Provide manufacturer's heavy duty construction combination horn and strobe (white lens) unit. Horns shall be listed for fire alarm use by Underwriter's Laboratories, Inc. The alarm signals shall be semi-flush mounted at the locations indicated on the plans. All outdoor alarm signals shall be horn only, mounted in a weatherproof box. All alarms shall be intermittent.

Y. All audible alarms must be 15 dba above ambient or exceed any maximum sound level for 60 seconds by 5 dba, whichever is louder. Sound levels not-to-exceed 120 dba.

2.05 BATTERY BACK-UP

A. The fire alarm/smoke detection system shall be battery back-up for 24 hours with five (5) minutes of alarm capabilities.

PART 3 - EXECUTION

3.01 INSTALLATION OF FIRE ALARM AND DETECTION SYSTEMS

A. Install fire alarm and detection systems as indicated, in accordance with equipment manufacturer's written instructions and complying with applicable portions of NEC and NECAs "Standard of Installation".

B. Wiring Systems and Materials

1. Wiring shall be in accordance with requirements of the National Electrical Code and NFPA 72. The fire alarm system, including components and wiring, shall be completely installed and wiring shall be properly tagged and color coded. The Electrical Contractor shall make final connections as shown and required by the equipment manufacturer's wiring instructions.

2. Use 14 AWG minimum size conductors for fire alarm detection and signal circuit conductors. Install wiring in conduit along with continuous ground wire. Provide wiring of adequate size to prevent voltage drop. Submit load calculations for each signal circuit and zone circuit indicating actual voltage drop and proper size conductors.

3. Color Code - the color codes of the fire alarm cabling shall conform with the following:

   a) Horn - Red (+) and Black (-).
   b) Pull Station/Heat/Smoke Detector - Blue and Yellow.
   c) Fan Shut-down/Door Release - White.
   d) Visual Flashing Lamps - Purple and Orange.

4. All junction box covers shall be painted red and all lengths of conduit shall have at least one red stripe.

5. Shutdown relays and control equipment shall be mounted within three feet of controlled device. A/C unit shutdown and smoke damper control to be wired on a separate circuit.

6. Visual flashing lamps shall be wired on a separate circuit from horns and other indicating and initiating devices.

3.02 QUALITY ASSURANCE

A. NEC Compliance - Comply with NEC as applicable to construction and installation of fire alarm and detection system components and accessories.

B. UL Compliance and Labeling - Provide fire alarm and detection system components which are UL listed and labeled.

C. Misc. Compliance - The fire alarm system is to be installed in accordance with the equipment manufacturer's written instructions and complying with all applicable portions of the NECAs "Standard of Installation" and all local codes and ordinances.

3.03 FIELD QUALITY CONTROL

A. Inspect relays and signals for malfunctioning and, where necessary, adjust units for proper operation to fulfill project requirements. Any final adjustment shall be performed by specially trained personnel by manufacturer of fire alarm and detection system equipment. The manufacturer's representative shall perform a quality inspection of the final installation and, in the presence of the Electrical

Contractor, fire marshal and Owner's Representatives, shall perform a complete functional test of this system. A system certification verifying the proper system operation shall be required prior to acceptance by the Owner.

B. Testing: The Contractor shall perform all electrical and mechanical tests required by the equipment manufacturer's form and National Fire Protection Association. All test and report costs shall be in the contract price. A checkout report shall be prepared by the installation technicians and submitted in triplicate, one (1) copy of which will be registered with the equipment manufacturer. The report shall include, but not be limited to:

1. A complete list of equipment installed and wired.
2. Indication that all equipment is properly installed and functions

3. Tests of individual zones, as applicable.
4. Serial numbers, locations by zone and model number for each installed detector.
5. Response time on thermostats and flame detectors (if used).
6. Technician's name, certificate number and date.

C. Documentation: After completion of the tests and adjustments listed above, the Contractor shall submit the following information to the Owner.

1. A copy of the test report described in this specification and a Certificate of Compliance prepared as per National Fire Protection Association Standard and State Fire Marshal's Rule 4A-48 to be completed at final test.
2. Affixed to FACP a standard service tag, as described in rule 4A-48 for fire alarm contractors by the Office of the State Fire Marshal.

D. Final tests and inspection shall be held in presence of the Owner's Representatives and Engineer's Representatives and to their satisfaction. The Contractor shall supply personnel and required auxiliary equipment for this test without additional cost.

E. To assure that wire size, power supply, number of devices on a circuit, etc. are suitable to support 100% of devices being in alarm or operated simultaneously, this tests shall include the following:

1. Place all sensors and monitor modules in alarm. Each shall display its address or zone and alarm condition. At least the first five (5) devices on each circuit shall also have their alarm LEDs lighted.

2. Operate all control modules for the alarm or operated condition. Each module shall display its address and condition.

3. Reset all alarmed and operated devices. The panel shall display the address or zone of any off-normal devices.

4. Test a representative number of sensors for alarm verification by momentarily testing for alarm. The sensor shall not initiate an alarm. Then, test by placing the sensor in alarm such that it remains in alarm for the selected verification time. The sensor shall initiate an alarm.

F. Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a ninety (90) day test period without any unwarranted alarms. Should unwarranted alarm(s) occur, the Contractor shall readjust or replace the detector(s) and begin another ninety (90) day test period. As required by the Engineer, the Contractor shall recheck the detectors using the fire test after each readjustment or replacement of detectors. This test shall not start until the Owner has obtained beneficial use of the building under tests.

G. If the requirements provided in the paragraph above are not completed within thirty (30) days after completion of the second 90 day test period, the Contractor shall replace the system with another acceptable manufacturer and the process repeated until acceptance of the equipment by the Owner.

H. The Contractor shall provide three (3) sets of signed and sealed submittals to be accepted upon the Architect/Engineer's approval.

I. A statement of guarantee including date of termination and name and phone number of the person to be called in the event of equipment failure.

J. Individual factory issued manuals containing all technical information on each piece of equipment installed. In the event that such manuals are not obtainable from the factory, it shall be the responsibility of the Contractor to compile and include them. Advertising brochures or operational instructions shall not be used in lieu of the required technical manuals.

K. One (1) copy of all approved shop drawings, instruction sheets, operating instructions, and spare parts bulletins.

L. A training session, for personnel selected by the Owner, shall be presented by a fully qualified, trained representative of the equipment manufacturer who is thoroughly knowledgeable of the specific installation.

M. Provide a written description of standard control panel functions and user instructions at each FACP. These instructions shall be written in standard laymen's English so that an unfamiliar operator can accomplish basic functions such as reset.

3.04 SYSTEM GUARANTEE

A. All components, parts, and assemblies supplied by the manufacturer shall be guaranteed against defects in materials and workmanship for a period of twelve (12) months commencing the date of substantial completion. Warranty service shall be provided by a qualified factory-trained representative of the equipment manufacturer during normal working hours. The representative must be able to respond to warranty calls within twelve (12) hours of notice whether oral or written.

B. Provide, within one (1) year after final acceptance, testing as per National Fire Protection Association 72, which shall consist of:

1. Regularly and systematically examine, adjust and clean all the electrical and mechanical components of waterflow switches as required by code.

2. Test and Written report which certify that all initiating devices have been tested and which indicate the result of the inspection.

END OF SECTION 16721