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IFB NO. Y15-719-SB

INVITATION FOR BIDS
FOR
JOHN YOUNG COMMUNITY PARK

****

PART H
TECHNICAL SPECIFICATIONS

VOLUME II

SPECIFICATION MANUAL

PERMIT DOCUMENTS

Division 1 through Division 16

ORANGE COUNTY

JOHN YOUNG COMMUNITY PARK

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PERMIT DOCUMENTS

September 8, 2014

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Division 1
General Requirements

SECTION 01005
ADMINISTRATIVE PROVISIONS

PART I GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. Work of this Contract comprises building, site work and related construction work to produce a complete and functional facility including but not limited to site work, plumbing, mechanical, and electrical.

1.02 CONTRACT METHOD

A. Construct the work as follows:
Part A: soccer fields, play area, skate park, sidewalks, parking, site work:
Lump Sum

1.03 COORDINATION

A. Coordinate work of the various Sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later.

B. Verify characteristics of elements of interrelated operating equipment are compatible; coordinate work of various Sections having interdependent responsibilities for installing, connecting to and placing in service, such equipment. Differences shall be brought to the Owner's attention during bid process or remain the responsibility of the Contractor.

C. Coordinate space requirements and installation of items, such as, but not limited to, mechanical and electrical work which are indicated diagrammatically or otherwise on drawings. Follow routing shown for pipes, ducts and conduits, as closely as practicable; make runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance and for repairs.

D. In finished areas (except as otherwise shown), conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.

E. Execute cutting and patching to integrate elements of work, uncover ill timed, defective and nonconforming work, provide openings for penetrations of existing surfaces and provide samples as specified in individual sections for testing. Seal penetrations of existing surfaces and provide samples as specified in individual sections for testing. Seal penetrations through floors, walls and ceilings, and fire safe where necessary as part of the lump sum price.

1.04 FIELD ENGINEERING SURVEYING

A. Provide field engineering surveying services; establish grades, lines and levels, by use of engineering survey practices recognized as standard by the survey industry. Said work shall be required to be provided by a Professional Land Surveyor, registered as such in the State of Florida.

B. Control datum for survey is that shown on Grading and Drainage Plan. Locate and protect control and reference points, per requirements stated in Part F, Article 6 of the GENERAL CONDITIONS.

1.05 REFERENCE STANDARDS

A. For products specified by association or trade standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. The date of the standard is that in effect when a specified date is specified.

C. Obtain copies of referenced standards listed in individual specification sections. Maintain copy at job site during progress of the specific work.

END OF SECTION 01005

SECTION 01010
SUMMARY OF WORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 PROJECT DESCRIPTION

A. Performance of all tasks specified in the contract documents shall be the responsibility of the contractor unless specified otherwise.

B. This project the following components:
A) The Base Bid consists of a new county park as fully delineated in the construction document drawings, with associated soccer fields, entry road, fencing, sidewalks, playground, picnic pavilion, 2 parking areas & skate park. This component will be a lump sum price.

B) Deductive-Alternate #1-Remove the East parking lot and road extending from the west parking lot. Remove associated East parking lot lights, power, landscaping & irrigation, etc. Power & utility infrastructure for future to remain in bid. Stabilized base for road to remain in bid.

C) Deductive-Alternate #2- Remove all site lighting for the entry road, soccer fields, skate park, west parking lot, and any associated power requirements. Infrastructure for future lighting to remain.

D) Deductive-Alternate #3- Remove the county's prototype restroom facility (designed by others), all associated power, lighting, landscaping, irrigation, sanitary, mechanical or other system infrastructure required for a fully functioning restroom facility to remain in base bid for future restroom building.

C. Contractor is responsible for all permit fees. The Owner is responsible for impact and connection fees.

1.03 BUILDING/SITE SECURITY

A. Contractor shall hire a reputable, insured security service to provide an armed security guard on site during all hours when the contractor is not on site.

This cost will be shown as a separate line item under Part A of the project.

B. The construction site currently has a 6' chain link & other fences around the most of the perimeter of the construction site. Modifications may be made by the contractor as needed.

1.04 CONTRACTOR USE OF PREMISES

A. General: During the construction period, the Contractor shall have full use of the premises for construction operations, including use of the site. The Contractor's use of the premises is limited only by the Owner's right to perform construction operations with its own forces or to employ separate contractors on portions of the project.

B. General: Limited use of the premises to construction activities in areas indicated within the limit of the premises. The Contractor may use any portion of the site for storage or work areas or any legal purpose.

1. Confine operations to areas within Contract limits indicated on the Drawings. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.

2. Keep driveways and entrances serving the premises clear and available to the Owner and the Owners' employees at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

3. Burial of Waste Materials: Do not dispose of organic and hazardous material on site, either by burial or by burning.

1.05 DISTRIBUTION OF RELATED DOCUMENTS

A. The Contractor is solely responsible for the distribution of ALL related documents/drawings to ALL appropriate vendors/subcontractors to ensure proper co- ordination of all aspects of the project and its related parts during bidding and construction.

1.06 CONSTRUCTION BULLETIN BOARD

A. The Contractor shall erect and maintain a weather protected bulletin board of sufficient size to display all permits, notices and other documents required to be posted for the Project. Said bulletin board shall be in a location that provides un- obstructed access for inspection by the Architect, the Project Manager, County Representatives, and authorities having jurisdiction over the project.

PART 2 PRODUCTS

2.01 ASBESTOS FREE MATERIAL

A. Contractor shall provide a written and notarized statement on company letter-head(s) to certify and warrant that ONLY ASBESTOS FREE MATERIALS AND PRODUCTS were provided as required by the Architect in Section 01400, QUALITY CONTROL. Such statement shall be submitted with the final payment request. Final payment shall not be made until such statement is submitted. Contractor agrees that if materials containing asbestos are subsequently discovered at any future time to have been included in the construction, the Contractor shall be liable for all costs related to the redesign or modification of the construction of the project so that materials containing asbestos are removed from the facility. If construction has begun or has been completed pursuant to a design that includes asbestos containing materials, the Contractor shall also be liable for all costs related to the abatement of such asbestos.

PART 3 EXECUTION (Not applicable).

END OF SECTION 01010

SECTION 01027
APPLICATION FOR PAYMENT

PART I GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.

B. The Contractor's Construction Schedule and Submittal Schedule are included in Section 01300 – SUBMITTALS

1.03 SCHEDULE OF VALUES

A. Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

1. Submit the Schedule of Values to the Owner at the earliest feasible date, but in no case later than Preconstruction Meeting. Refer to Section 01200.

2. Sub-Schedules: Where the Work is separated into phases that require separately phased payments, provide sub-schedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.

1. Identification: Include the following project identification on the Schedule of Values:

a. Project name and location.
b. Name of the Architect
c. Project Number
d. Contractor's name and address
e. Date of submittal

2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:

   a. Generic name
   b. Related Specification Section
   c. Change Orders (numbers) that have affected value d. Dollar Value
   e. Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent

3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items:

   a. A value will be given for at least every major specification section (subsections can logically be grouped together).
   b. A single material subcontractor (i.e. sod, window blinds) will not be required to be broken down into labor and material unless it is anticipated the materials will be stored and invoiced prior to installation.
   c. All multiple item subcontracts or work items (i.e. concrete, roofing, painting, mechanical, electrical items, etc.) will be shown broken down at least in labor and material (all taxes, burden and overhead and profit included).
   d. Mobilization (move-on, bond, insurance, temporary office and sanitary service installation) shall not exceed 2 1/2% of contract price.
   e. For multi-story work all items broken down per floor.
   f. Concrete broken down at least into foundation slab on grade, columns, beams and suspended slabs.
   g. Masonry divided into C.M.U. brick, stem walls, exterior walls, interior walls and elevator shaft.
   h. Plumbing broken down at least into underslab rough-in, vents and stacks supply piping, equipment items (each listed separately), fixtures and trim.
   I. HVAC: Typically shown per specification section, labor and material, per floor.
   j. Electrical: same as HVAC.
   k. Fire protection broken down at least into underground, rough-in and trim. All per building and labor and material.
   l. Logical grouping of specification subsections is permitted.

4. Round amounts off the nearest whole dollar, the total shall equal the Contract Sum.

5. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

6. Margins of Cost: Show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete including its total cost and proportionate share of general overhead and profit margin.

   a. At the Contractors' option, temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown as separate line items in the Schedule of Values or distributed as general overhead expense.

7. Schedule Updating: Update and resubmit the Schedule of Values when Change Orders or Construction Change Directives result in a change in the contract sum.

1.04 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as reviewed by the Owner representative and paid for by the Owner.

   1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the Final Application for Payment involve additional requirements. See items G, I, J and K of this section.

B. Payment Application Times: The period of construction work covered by each Application of Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use the County's most updated form as the form for Application for Payment. Form given at the Preconstruction Conference.

D. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.

   1. Entries shall match data on the Schedule of Values and Contractors' Construction Schedule. Use updated schedules if revisions have been made.

   2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.

E. Transmittal: Submit four (4) original executed copies of each Application for Payment to the Project Manager; one copy shall be complete, including waivers of lien and similar attachments, when required.

1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Project Manager.

F. Payment will be processed once a month. Payment for item will be based on percentage completed as determined and approved by the County Project Manager or invoice for stored materials. Retainage (10%) will be held for all applications.

G. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment; this application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work. Application shall also include all items listed in Part H. above.

H. Final Payment Application: Administrative actions and submittals, which must precede or coincide with submittal of the final payment. Application for Payment includes the following:

1. Completion of Project Close-Out requirements
2. Completion of items specified for completion after Substantial Completion (Punch List)
3. Contractor's release of lien (on Owner's form)
4. Subcontractor and material supplier release of lien
5. Consent of Surety
6. Power of attorney
7. Asbestos-free letter

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 01027

SECTION 01035
MODIFICATION
PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This section specifies administrative and procedural requirements for handling and processing Contract modifications.

1.03 MINOR CHANGES IN THE WORK

A. Supplemental instructions authorizing minor changes in the work, not involving an adjustment to the Contract Sum or Contract Time, will be issued by the Project Manager.

1.04 CHANGE ORDER PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Proposed changes in the work that will require adjustment to the Contract Sum or Contract Time will be issued by the Project Manager, with a detailed description of the proposed change and supplemental or revised Drawings and Specifications, if necessary.

1. Proposal requests issued by the Project Manager are for information only. Do not consider them instruction either to stop work in progress, or to execute the proposed change.

2. Unless otherwise indicated in the proposal request, within 7 days of receipt of the proposal request, submit to the Project Manager from the Owner's review, an estimate of cost necessary to execute the proposed change.

   a. Include a list of quantities of products to be purchased and unit costs, along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
   b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   c. Include a statement indicating the effect the proposed change in the work will have on the Contract Time.
   d. Contractor and subcontractors will provide a complete detailed labor and material breakdown to justify change order request amount.

B. Contractor-Initiated Change Order Proposal Requests: When latent or other unforeseen conditions in mutual accord with the Owner Representatives findings require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Architect.

1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.

2. Include a list of quantities of products to be purchased and unit costs along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.

3. Comply with requirements in Section 01631 Product Substitutions- if the proposed change in the work requires that substitution of one product or system for a product or system not specified.

4. Contractor and subcontractors will provide a complete detailed labor and material breakdown to justify change order request amounts.

1.05 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: When the Owner and Contractor are not in total agreement on the terms of a Change Order Proposal Request, the Project Manager may issue a Construction Change Directive instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. The Construction Change Directive will contain a complete description of the change in the Work and designate the method to be followed to determine change in the Contract Sum or Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.07 CHANGE ORDER PROCEDURES

A. Upon the Owner's approval of a Change Order Proposal Request, the Project Manager will issue a Change Order for signatures of the Owner and Contractor on County's Change Order form, as provided in the Conditions of the Contract.

END OF SECTION 01035

SECTION 01040
PROJECT COORDINATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section specifies administrative and supervisory requirements necessary for project coordination including, but not necessarily limited to:

1. Coordination
2. Administrative and supervisory personnel
3. General installation provisions
4. Cleaning and protection

B. Progress meetings, coordination meetings And Pre-installation conferences are included in Section 01200 Project Meetings.

C. Requirements for the Contractors Construction Schedule are included in Section 01300 Submittals.

1.03 COORDINATION

A. Coordination: Coordinate construction activities included under various Sections of these Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specification that are dependent upon each other for proper installation, connection, and operation.

1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.

2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required: notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Schedules
2. Installation and removal of temporary facilities
3. Delivery and processing of submittals
4. Progress meetings
5. Project close-out activities

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment (if any) involved in performance of, but not actually incorporated in, the Work.

E. Lack of coordination as specified in this and other sections of the contract documents are in grounds for assessment of back charges and/or termination in order to remediate the situation.

1.04 SUBMITTALS

A. Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. Show the interrelationship of components shown on separate Shop Drawings.

2. Indicate required installation sequences.

3. Comply with requirements contained in Section Submittals.

4. Refer to Division-16 Section Basic Electrical Requirements for specific coordination drawing requirements for electrical installations.

B. Staff Names: At the Preconstruction Conference submit a list of the Contractors principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.

1. Post copies of the list in the project meeting room, the temporary field office, and each temporary telephone.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.01 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

D. Provide attachment and connection devices and methods necessary for securing work. Secure work true to line and level. Allow for expansion and building movement.

E. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable choices to Project Manager for final decision.

F. Recheck measurements and dimensions, before starting each installation.

G. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect/Project Manager for final decision.

3.02 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

B. Clean and maintain completed construction as directed by the Project Manager and as frequently as necessary to ensure its integrity and safety through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where the applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading
2. Excessively high or low temperatures
3. Excessively high or low humidity
4. Air contamination or pollution
5. Water
6. Solvents
7. Chemicals
8. Soiling, staining and corrosion
9. Rodent and insect infestation
10. Combustion
11. Destructive testing
12. Misalignment

13. Excessive weathering
14. Unprotected storage
15. Improper shipping or handling
16. Theft
17. Vandalism

END OF SECTION 01040

SECTION 01045
CUTTING AND PATCHING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for cutting and patching.

B. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1. Requirements of this Section apply to mechanical and electrical installations. Refer to Division-15 and Division-16 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.03 SUBMITTALS

A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.

2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the buildings appearance and other significant visual elements.

3. List products to be used and firms or entities that will perform Work.

4. Indicate dates when cutting and patching is to be performed.

5. List utilities that will be disturbed or affected, including those that

will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.

6. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.

7. Approval by the Architect to proceed with cutting and patching does not waive the Architects right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

1.04 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load carrying capacity or load-deflection ratio.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements.

a. Foundation construction
b. Bearing and retaining walls
c. Structural concrete
d. Structural steel
e. Lintels
f. Timber and primary wood framing g. Structural decking
h. Miscellaneous structural metals
I. Stair systems
j. Exterior curtain wall construction
k. Equipment supports
l. Piping, ductwork, vessels and equipment
m. Structural systems of special construction in Division 13.

B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems.

a. Shoring, bracing and sheeting
b. Primary operational systems and equipment
c. Air or smoke barriers
d. Water, moisture, or vapor barriers
e. Membranes and flashings
f. Fire protection systems
g. Noise and vibration control elements and systems
h. Control systems
I. Communication systems
j. Conveying systems
k. Electrical wiring systems
l. Special construction specified by Division-13 Sections

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architects opinion, reduce the buildings aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace work cut and patched in a visually unsatisfactory manner.

1. If possible retain the original installer or fabricator to cut and patch the following categories of exposed work, or if it is not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm:

a. Processed concrete finishes
b. Preformed metal panels
c. Window wall system
d. Stucco and ornamental plaster
e. Acoustical ceilings
f. Carpeting
g. Wall covering
h. HVAC enclosures, cabinets or covers
I. Roofing systems

PART 2 PRODUCTS

2.01 MATERIALS

A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect unless otherwise indicated by Architect/Owner. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 EXECUTION

3.01 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

1. Before proceeding, meet at the site with all parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.02 PREPARATION

A. Temporary Support: Provide temporary support of work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed.

C. Avoid interference with use of adjoining areas and interruption of free passage to adjoining areas.

D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.03 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installers recommendations.

1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

3. Cut through concrete and masonry using a cutting machine such as a Carborundum saw or diamond core drill.

4. Comply with requirements of applicable Sections of Division-2 where cutting and patching required excavating and backfilling.

5. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance.

Remove existing floor and wall coverings and replace with new materials if necessary to achieve uniform color and appearance.

a. Where patching occurs in a smooth painted surfaces, extend final coat over entire unbroken surfaces containing the patch, after the patched area has received primer and second coat.

3.04 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged materials to their original condition.

END OF SECTION 01045

SECTION 01095
REFERENCE STANDARDS AND DEFINITIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. Indicated: The term *indicated* refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as shown, noted, scheduled and specified are used, it is to help the reader locate the reference; no limitation on location is intended.

C. Directed: Terms such as directed, requested, authorized, selected, accepted, required, and permitted mean directed by the Project Manager, requested by the Architect/Project Manager and similar phrases.

D. Approved: This term approved means accepted, where used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.

E. Regulations: The term Regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. Furnish: The term furnish is used to mean supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. Install: The term install is used to describe operations at project site including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. Provide: The term provide means to furnish and install, complete and ready for the intended use.

I. Installer: An Installer is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term experienced, when used with the term Installer, means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.

2. Trades: Use of titles such as carpentry is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as carpenter. It also does not imply that requirements specified apply exclusively to trades persons of the corresponding generic name.

J. Project Site is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

K. Testing Laboratories: A testing laboratory is an independent entity engaged to perform specific inspections or tests, either at the Project sites or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.03 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16 Division format and MASTER FORMAT numbering system.

B. Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language: Language used in Specifications and other Contract Documents is the abbreviated type. Words and meaning shall be interpreted as appropriate. Words that are implied, but not stated shall be interpolated as the sense required. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the context of the Contract Documents so indicates.

2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

   a. The words, shall be shall be included by inference wherever a colon (:) is used within a sentence or phrase.

1.04 INDUSTRY STANDARDS

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copies directly into the Contract Documents to the extend reference. Such standards are made part of the Contract Documents by reference.

B. Publication Dates: Comply with the standard in effect as of the date of the Contract Documents.

C. Conflicting Requirements: Where compliances with two or more standards are specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels. Refer requirements that are different, but apparently equal, and uncertainties to the Architect for a decision before proceeding.

   1. Minimum Quantity or Quality Levels: The quantity of quality level shown or specified shall be the minimum provided or performed.

      The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Refer uncertainties to the Architect/Owner for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.

   1. Where copies of standards are needed for performance of a required construction activity. The Contractor shall obtain copies directly from the publication source or any other authorized source.

E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. See Trade Reference List at the end of this Section refer to the Encyclopedia of Associations, published by Gale Research Co., available in most libraries.

1.05 GOVERNING REGULATIONS/AUTHORITIES

A. The Architect has contacted authorities having jurisdiction where necessary to obtain information necessary the preparation of Contract Documents. Contact authorities having jurisdiction directly for information and decisions having a bearing on the work.

1.06 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulation bearing upon performance of the Work.

1.07 TRADE REFERENCES

Acronyms for abbreviations used in the Specifications or other Contract Documents mean the recognized name of the trade association, standards generating organization, authority that have jurisdiction or other entity applicable to the context of the text provision.

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute

ACIL	American Council of Independent Laboratories
ACPA	American Concrete Pipe Association
ADC	Air Diffusion Council
AGA	American Gas Association
AHA	American Hardboard Association
AI	Asphalt Institute
AIHA	American Industrial Hygiene Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
APA	American Plywood Association
ARI	Air Conditioning and Refrigeration Institute
ASA	Acoustical Society of America
ASC	Adhesive and Sealant Council
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers ASSE
	American Society of Sanitary Engineers ASTM
	American Society of Testing of Materials AWI
	Architectural Woodwork Institute
AWPB	American Wood Preservers Bureau
AWS	American Welding Society

AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
CISPI	Cast Iron Soil Pipe Institute
CRSI	Concrete Reinforcing Steel Institute
DHI	Door and Hardware Institute
DLPA	Decorative Laminate Products Association EIMA
	Exterior Insulation Manufacturers Association
FGMA	Flat Glass Marketing Association
FM	Factory Mutual Engineering and Research
GA	Gypsum Association
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronic Engineers IESNA
	Illuminating Engineering Society of North America
MBMA	Metal Building Manufacturers Association
ML/SFA	Metal Lath/Steel Framing Association
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry
NAAMM	National Association of Architectural Metal Mfgs.
NAPA	National Asphalt Pavement Association
NAPF	National Association of Plastic Fabricators (Now DLPA)
NBHA	National Builder's Hardware Association (Now DHI) NCMA
	National Concrete Masonry Association
NEC	National Electric Code
NECA	National Electric Contractors Association
NEII	National Elevator Industry, Inc.

NFPA	National Fire Protection Association
NHLA	National Hardwood Lumber Association
NPA	National Particle board Association
NPCA	National Paint and Coatings Association
NRCA	National Roofing Contractors Association
NSF	National Sanitation Foundation
NWMA	National Woodwork Manufacturers Association (Now NWWDA) NWWDA
	National Wood Window and Door Association (Formerly NWMA)
PDI	Plumbing and Drainage Institute
RFCI	Resilient Floor Covering Institute
RMA	Rubber Manufacturers Association SDI Steel Deck Institute
S.D.I.	Steel Door Institute
SGCC	Safety Glazing Certification Council
SHLMA	Southern Hardwood Lumber Manufacturers Association (Now HMA)
SIGMA	Sealed Insulating Glass Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SJI	Steel Joist Institute
SPRI	Single Ply Roofing Institute
SSPC	Steel Structures Painting Council
SWI	Steel Window Institute
TCA	Tile Council of America
UL	Underwriters Laboratories
WCMA	Wall Covering Manufacturers Association
WRI	Wire Reinforcement Institute

WSFI Wood and Synthetic Flooring Institute

1.08 FEDERAL GOVERNMENT AGENCIES

A. Names and titles of federal government standard or Specification producing agencies are frequently abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of standard of Specification producing agencies of the federal government. Names and addresses are subject to change but are believed to be, but are not assured to be, accurate and up-to-date as of the date of the Contract Documents.

CE Corps of Engineers
(US Department of the Army)
Chief of Engineers - Referral
Washington, DC 20314 (202) 272-0660

CFR Code of Federal Regulations
Available from the Government Printing Office North Capitol St. Between G and H Street, NW Washington, DC 20402
(202) 783-3238

(MATERIAL IS USUALLY FIRST PUBLISHED IN THE FEDERAL REGISTER)

CPSC Consumer Product Safety Commission
5401 Westbard Avenue
Washington, DC 20816 (800) 638-2772

CS Commercial Standard
(US Department of Commerce)
Government Printing Office
Washington, DC 20402 (202) 377-2000

DOC Department of Commerce
14th Street and Constitution Ave., NW
Washington, DC 20230 (202) 377-2000

DOT Department of Transportation
400 Seventh St., SW
Washington, DC 20590 (202) 426-4000

EPA	Environmental Protection Agency 401 M. St., SW Washington, DC 20460	(202) 382-2090
FAA	Federal Aviation Administration (U.S. Department of Transportation) 800 Independence Avenue SW Washington, DC 20590	(202) 366-4000
FCC	Federal Communications Commission 1919 M. Street NW Washington, DC 20554	(202) 632-7000
NBS	National Bureau of Standards (U.S. Department of Commerce) Gaithersburg, MD 20899	(301) 921-1000
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor) Government Printing Office Washington, DC 20402	(202) 523-7001
PS	Product Standard of NBS (U.S. Department of Commerce) Government Printing Office Washington, DC 20402	(202) 783-3238
USDA	U.S. Department of Agriculture Independence Avenue Between 12th and 14 Street, SW Washington, DC 20250	(202) 447-8732

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

(Not Applicable)

END OF SECTION 01095

SECTION 01200
PROJECT MEETINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:

1. Pre-Construction Conference
2. Pre-Installation Conference
3. Coordination Meetings
4. Progress Meetings

B. Construction schedules are specified in Section 01300 Submittals.

1.03 PRE-CONSTRUCTION CONFERENCE

A. Schedule a pre-construction conference and organizational meeting at the project site or other convenient location no later than 20 days after execution of the agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.

B. Attends: The OWNERS Representative, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.

C. Agenda: Discuss items of significance that could affect progress including such topics as:

1. Tentative construction schedule
2. Critical Work sequencing and/coordinating
3. Designation of responsible personnel
4. Procedures for processing field decisions and Change Orders
5. Procedures for processing Applications for Payment
6. Distribution of Contract Documents

7. Submittal of Shop Drawings, Product Data and Samples
8. Preparation of record documents
9. Use of the Premises
10. Office, Work and storage areas
11. Equipment deliveries and priorities
12. Safety procedures
13. First aid
14. Security
15. Housekeeping
16. Working hours

D. Contractor must submit at the time of the meeting at least the following items:

1. Schedule of Values
2. Listing of key personnel including project superintendent and subcontractors with their addresses, telephone numbers, and emergency telephone numbers.
3. Preliminary Construction Schedule
4. Submittal Schedule

1.04 PRE-INSTALLATION CONFERENCE

A. Conduct a Pre-installation conference at the site before each construction activity that requires coordination with other construction. The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise at least 48 hours in advance the Project Manager of scheduled meeting dates.

1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:

a. Contract Documents
b. Options
c. Related Change Orders
d. Purchases
e. Deliveries
f. Shop Drawings, Product Data and Quality Control Samples
g. Possible conflicts
h. Compatibility problems
I. Time schedules
J. Weather limitations
k. Manufacturer's recommendations
l. Comparability of materials
m. Acceptability of Substrates

n. Temporary facilities
o. Space and access imitations
p. Governing regulations
q. Safety
r. Inspection and testing requirement
s. Required performance results
t. Recording requirement
u. Protection

2. Record significant discussions and agreements and disagreements of each conference along with and approved schedule. Distribute the record of the meeting to everyone concerned promptly including the Owner and Architect.

3. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.05 COORDINATION MEETINGS

A. Conduct project coordination meeting at weekly intervals on day and time as established by the Project Manager or more frequently, if necessary convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.

B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved, to include subcontractors and representatives.

C. Contractor shall record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.06 PROGRESS MEETINGS

A. Conduct progress meetings at the Project site at bimonthly intervals or more frequently if necessary as directed by the Project Manager. Notify the Owner at least 48 hours in advance of scheduled meeting time and dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees: In addition to representatives of the Owner and Architect, each subcontractor, supplier or other entity concerned with current progress of involved in planning, coordination or performance of future activities with the project and authorized to conclude matters relating to progress.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time, ahead, or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
2. Review the present and future needs of each entity present, including such items as:

a. Interface requirements
b. Time
c. Sequences
d. Deliveries
e. Off-site fabrication problems
f. Access
g. Site utilization
h. Temporary facilities and services
I. Hours of work
j. Hazards and risks
k. Housekeeping
l. Quality and work standards
m. Change Orders
n. Documentation of information for payment requests.

D. Reporting: No later than 3 days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary or progress since the previous meeting and report.

END OF SECTION 01200

SECTION 01300
SUBMITTALS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including:

1. Contractors Construction Schedule
2. Submittal Schedule
3. Daily Construction Reports
4. Shop Drawings
5. Product Data
6. Samples

B. Administrative Submittals: Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

1. Permits
2. Applications for Payment
3. Performance and Payment Bonds
4. Insurance Certificates
5. List of Subcontractors with start and finish dates (update as necessary)
6. Schedule of Values
7. Construction Schedule

C. The Schedule of Values submittal is included in Section 01027 Applications for Payment.

D. Inspection and test reports are included in Section 01044 Quality Control Services.

1.03 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.

a. The Project Manager reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

3. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.

a. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Project Manager will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
b. If an intermediate submittal is necessary, process the same as the initial submittal.
c. Allow two weeks for reprocessing each submittal.
d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. Provide a space approximately 4" x 5" on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.

2. Include the following information on the label for processing and recording action taken.
a. Project name
b. Date
c. Name and address of Architect
d. Name and address of Contractor

e. Name and address of subcontractor
f. Name and address of supplier
g. Name of manufacturer
h. Number and title of appropriate Specification Section
I. Drawing number and detail references, as appropriate.

C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Project Manager using transmittal form as provided by the Project Manager. Submittals received from sources other than the Contractor will be returned without action.

1. On the transmittal record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitation. Include Contractor's certification that information complies with Contract Document requirements.

2. Transmittal Form: As provide by the Project Manager

D. Contractor shall be responsible for cost of re-review of rejected submittals, shop drawing, etc. Costs for re-review shall be reimbursed to the County by deducting the cost from the Contractors monthly progress payments. Costs to be determined by applying the consultants standard billing rates, plus 10% handling by the County.

E. Substitution request to specified products will be made within 30 days of Notice to Proceed. After the 30 day period, no requests for substitutions from the Contractor will be considered.

1. Substitution submitted within the first 30 days will have product data from specified and requested substitute submitted together and demonstrate better quality, cost savings if of equal quality, or show benefit to the County for excepting the substitute.

F. Once submittals are approved or approved as noted, they will be scanned and converted to PDF documents with OCR (optical character recognition) and given to the owner.

1.04 CONTRACTOR□S CONSTRUCTION SCHEDULE

A. Critical Path Method (CPM) Schedule: Prepare a fully developed, horizontal bar-chart type Contractors construction schedule. Submit in accordance with Section 01200 Project Meetings.

1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first

working day of each week. Use the same breakdown of units of the work as indicated in the Schedule of Values.

2. Within each time bar, indicate estimated completion percentage in 10 percent increments. As work progresses, place a contrasting mark in each bar to indicate Actual Completion.

3. Prepare the schedule on a sheet, series of sheets, stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.

4. Secure time commitments for performing critical elements of the work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the work.

5. Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment request and other schedules.

6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's procedures necessary for certification of Substantial Completion.

B. Phasing: Provide notations on the schedule to show how the sequence of the work is affected by requirements for phased completion to permit work by separate Contractors and partial occupancy by the Owner prior to Substantial Completion.

C. Work Stages: Indicate important stages of construction for each major portion of the work, including testing and installation.

D. Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the work. Indicate where each element in an area must be sequenced or integrated with other activities.

E. Cost Correlation: At the head of the schedule, provide a two item cost correlation line, indicating pre-calculated and actual costs. On the line show dollar-volume of work performed as the dates used for preparation of payment requests.

1. Refer to Section Applications for Payment for cost reporting and payment procedures.

F. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the project meeting room and temporary field office.

1. When revision are made distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

G. Schedule Updating: Revise the schedule monthly or activity, where revisions have been recognized or made. Issue the updated schedule concurrently monthly pay request.

1.05 SUBMITTAL LOG

A. After development and acceptance of the Contractor's construction schedule, prepare a complete log of submittals.

1. Coordinate submittals log with the list of subcontracts, schedule of values and the list of products as well as the Contractor's construction schedule.

2. Prepare the log in chronological order; include all submittals required. Provide the following information:

a. Scheduled date for the first submittal
b. Related Section number
c. Submittal category
d. Name of subcontractor
e. Description of the part of the work covered
f. Scheduled date for resubmittal
g. Scheduled date the Architect's final release or approval.

3. All submittals must be received within the first 25% of contract time.

B. Distribution: Following response to initial submittal, print and distribute copies to the Project Manager, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the project meeting room and field office.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

C. Log Updating: Revise the log after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.06 DAILY CONSTRUCTION REPORTS

A. Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Project Manager at weekly intervals:

1. List of subcontractors at the site
2. Approximate count of personnel at the site
3. High and low temperatures, general weather conditions
4. Accidents and unusual events
5. Meetings and significant decisions
6. Stoppages, delays, shortages, losses
7. Meter readings and similar recordings
8. Emergency procedures
9. Orders and requests of governing authorities
10. Change Orders received, implemented
11. Services connected, disconnected
12. Equipment or system tests and start-ups
13. Partial completions, occupancies
14. Substantial Completions authorized

1.07 SHOP DRAWINGS

A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered a Shop drawing and will be rejected.

B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:

1. All required dimensions
2. Identification of products and materials included
3. Compliance with specified standards
4. Notation of coordination requirements
5. Notation of dimensions established by field measurement
6. Sheet Size: Except for templates, patterns and similar full-size Drawings on sheets at least 8 1/2" x 11" but no larger than 24" x 36".
7. Initial Submittal: Submit one correctable translucent reproducible print and one blue-or black-line print for the Project Manager’s review; the reproducible print will be returned.
8. Initial Submittal: Submit 2 blue-or black-line prints for the Architect's review; one will be returned.

9. Final Submittal: Submit 5 blue-or black-line prints; submit 7 prints where required for maintenance manuals. 3 prints will be retained; the remainder will be returned.
10. Final Submittal: Submit 3 blue-or black-line prints; submit 5 prints where required for maintenance manuals. 2 prints will be retained; the remainder will be returned.
    a. One of the prints returned shall be marked-up and maintained as a Record Documents.
11. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connections with construction.

C. Coordination drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.

1. Preparation of coordination Drawings is specified in section Project Coordination and may include components previously shown in detail on Shop Drawings or Product Data.

2. Submit coordination Drawings for integration of different construction elements. Show sequence and relationships of separate components to avoid any conflict including conflicts in use of space.

3. Contractor is not entitled to additional payments due to lack of compliance with this Section.

1.08 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturers installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as Shop Drawing.

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:

   a. Manufacturer's printed recommendations
   b. Compliance with recognized trade association standards
   c. Compliance with recognized testing agency standards
   d. Application of testing agency labels and seals
   e. Notation of dimensions verified by field measurement

f. Notation of coordination requirements
g. Manufacturers local representative and phone number.

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

3. Preliminary Submittal: Submit a preliminary single-copy of Product Data where selection of options is required.

4. Submittals: Submit six (6) copies of each required submittal. The Project Manager will return two (2) sets to the Contractor marked with action taken and corrections or modifications required.

a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

5. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.

a. Do not proceed with installation until an applicable copy of Product Data applicable is in the Installers possession. b. Do not permit use of unmarked copies of Product Data in connection with construction.

1.09 SAMPLES

A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of materials, color range sets, and swatches showing color, texture and pattern.

1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Architect's/Owner's Sample. Include the following:

a. Generic description of the Sample
b Sample source
c. Product name or name of manufacturer
d. Compliance with recognized standards
e. Availability and delivery time

2. Submit Samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

a. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.

b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.

3. Preliminary submittals: Where Samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.

a. Preliminary submittals will be reviewed and returned with the Architects/Owners mark indicating selection and other action.

4. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; one will be returned marked with the action taken.

5. Maintain sets of Samples, as returned, at the project site, for quality comparisons throughout the course of construction.

a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
b. Sample sets may be used to obtain final acceptance of the construction associated with each set.

B. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.

1. Field Samples specified in individual sections are special types of Samples. Field Samples are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the work will be judged.

a. Comply with submittal requirements. Process transmittal forms to provide a record of activity.

1.10 ARCHITECTS ACTION

A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect/Project Manager will review each submittal, mark to indicate action taken, and return promptly.

B. Action Stamp: The Architect/Project Manager will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, similarly as follows, to indicate the action taken:

1. Final Unrestricted Release: Where submittals are marked □No Exceptions Taken□, that part of the work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.

2. Final-But-Restricted Release: When submittals are marked □Made Corrections Noted□ that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.

3. Returned for Resubmittal: When submittal is marked “Revise and Resubmit”, do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.

   a. Do not permit submittals marked “Revise and Resubmit” to be used at the Project site.

4. Rejected: Submittal does not comply with requirements of the Contract Documents. Submittal must be discarded and entirely new submittal shall be forward to the Project Manager without delay.

END OF SECTION 01300

SECTION 01400
QUALITY CONTROL SERVICES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for quality control services.

B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Architect.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and test, cover production of standard products as well as customized fabrication and installation procedures.

2. Inspection, test and related actions specified are not intended to limit the Contractor’s quality control procedures that facilitates compliance with Contract Document requirements.

3. Requirements for the Contractor to provide quality control services required by the Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.03 GENERAL QUALITY CONTROL

A. The Contractor shall be responsible for maintaining and ensuring quality control over subcontractors, suppliers, manufacturers, materials, equipment, products, services, site conditions and workmanship to product work of specified quality. The completed work shall be of high quality throughout.

1.04 WORKMANSHIP

A. Comply with well-known standards recognized be each trade except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality. Said qualifications shall be determined by well-known standards recognized by the trade for each respective portion of contract work.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration and racking.

1.05 MANUFACTURER'S INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from Architect before proceeding.

1.06 MANUFACTURER'S CERTIFICATES

A. When required by individual Specifications Section, submit manufacturer's certificate and supporting documentation, in duplicate, that products meet or exceed specified requirements.

B. ASBESTOS FREE MATERIALS - Manufacturer and/or supplier shall provide a written and notarized statement on manufacturer's company letterhead to certify and warrant that product (s) utilized on project are asbestos free.

1.07 MOCKUPS

A. When required by individual Specifications Section, erect complete, full scale mockup of assembly at Project Site.

1.08 MANUFACTURER'S FIELD SERVICES

A. When specified in respective Specification Sections, require supplier and/or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, test, adjust and balance of equipment as applicable and to make appropriate recommendations.

B. Representative shall submit written report to Owner listing observations, recommendations, and certifying full conformance and compliance with manufacturers standards or requirements.

1.09 TESTING LABORATORY SERVICES

A. The County shall employ and pay for services of an Independent Testing Laboratory to perform inspections, tests for construction materials (soils, concrete) and threshold inspections.

B. Services will be performed in accordance with requirements of governing authorities and with specified standards.

C. Reports will be submitted to the County, Contractor and Architect giving observations and results of tests, indicating compliance or noncompliance with specified standards and with Contract Documents.

D. Contractor shall cooperate with testing laboratory personnel; furnish tools, samples of materials, design, mix equipment, storage and assistance as requested.

1. The contractor shall be responsible for notifying the testing laboratory at least 24 hours prior to expected time for operations requiring testing services. Longer length of notice to testing laboratory shall be provided by Contractor when required by the testing laboratory to ensure the timely scheduling and performance of all tests required.

2. The Contractor is responsible for obtaining and paying tests including but not limited to test and balance, portable water

bacteriological tests and test required in Divisions 7 through 16.

E. The costs of any tests which fail will be paid for by the Contractor. The amount to be reimbursed to the County by the Contractor, will be the amount invoiced to the County by the testing laboratory in accordance with the testing services fees set forth in its contract with the County.

1.10 TEMPERATURE/HUMIDITY LOG

A. The Contractor shall be responsible for preparing rain, temperature and humidity measuring devices at the project site and maintaining a log of temperature and humidity measurements.

B. Said log shall contain a daily record of exterior temperature, rainfall amount and humidity conditions and where environmental conditions are specified in individual sections, a daily record of the temperature and humidity conditions where the work of those sections is stored and installed.

C. The Temperature/Humidity Log shall be available to the Project Manager as part of the Contract Documents.

1.11 RESPONSIBILITIES

A. The Owner shall provide inspections, tests and similar quality control services, specified in individual Specification Sections and these services include those specified to be performed by an independent agency and not by the Contractor.

B. The Contractor shall cover all costs of tests or inspections to evaluate means and methods of installation performed as a substitution and not as originally specified.

1. Re-testing: The Contractor is responsible for re-testing where results of required inspections, test or similar services prove unsatisfactory and do not indicate compliance with Contract Documents requirements, regardless of whether the original test was the Contractor’s responsibility.

a. Cost of re-testing construction revised or replaced by the Contractor is the Contractor’s responsibility, where required tests were performed on original construction.

2. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to:
   a. Providing access to the work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
   b. Taking adequate quantities of representatives samples of materials that require testing or assisting the agency in taking samples.
   c. Providing facilities for storage and curing the test samples.
   d. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
   e. Security and protection of samples and test equipment at the project site.

C. Duties of the Testing Agency: The independent testing agency engages to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections shall cooperate with Architect and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.

1. The agency shall notify the Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.

3. The agency shall not perform any duties of the Contractor.

D. Coordination: The Contractor and each agency engaged to perform inspection, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition, the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

1.12 SUBMITTALS

A. Qualification for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, which are pre- qualified as complying with Recommended Requirements for Independent Laboratory qualification by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engages on the Project shall be authorized by authorities having jurisdiction to operate in the State in which the Project is located.

PART 2 PRODUCTS (Not applicable)

PART 3 EXECUTION

3.01 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finished to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Document requirements for Cutting and Patching.

B. Protect construction exposed by or for quality control service activities, and protects and repaired construction.

C. Repair and protection in the Contractor’s responsibility regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 01400

SECTION 01410
TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selection and payment

B. Contractor Submittals

C. Laboratory responsibilities

D. Laboratory reports

E. Limits on testing laboratory authority

F. Contractor responsibilities

G. Schedule of inspections and tests

1.02 RELATED SECTIONS

A. Information Available to bidders: Soil Investigation Data.

B. General Conditions: Inspections, testing, and approvals required by public authorities.

C. Individual Specification Sections: Inspections and tests required, and standards for testing.

1.03 REFERENCES

A. ANSI/ASTM D3740 or as required in Specifications Divisions 2-16 - Practice for Evaluation of Agencies Engages in testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

B. ANSI/ASTM E329 or as required in Specifications Divisions 2-16 - Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

1.04 SELECTION AND PAYMENT

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

B. Employment of testing laboratory shall in no way relieve Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.05 QUALITY ASSURANCE

A. Comply with requirements of ANSI/ASTM E329 and ANSI/ASTM D3740

B. Laboratory: Authorized to operate in state in which Project is located. C.

Laboratory Staff: Maintain a full time registered Engineer on staff to review services.

D. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards (NBS) Standards or accepted values of natural physical constants.

1.06 CONTRACTOR SUBMITTALS

NOT USED

1.07 LABORATORY RESPONSIBILITIES A.

Test samples of mixes

B. Provide qualified personnel at site when required. Cooperate with Orange County and Contractor in performance of services.

C. Perform specified inspection, sampling, and testing of Products in accordance with specified standards.

D. Ascertain compliance of materials and mixes with requirements of Contract Documents.

E. Promptly notify Orange County and Contractor of observed irregularities or non-conformance of Work or Products.

F. Perform additional inspections and test required by Orange County. G.

Attend preconstruction conferences and progress meetings.

1.08 LABORATORY REPORTS

A. After each inspection and test, promptly submit four copies of laboratory report to Orange County, and to Contractor.

B. Include:

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

C. When requested by Orange County, provide interpretation of test results.

1.09 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

D. Laboratory has no authority to stop the work.

1.10 CONTRACTOR RESPONSIBILITIES

A. Cooperate with laboratory personnel, and provide access to the work. B.

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.

C. Notify Orange County and laboratory 24 hours prior to expected time for operations requiring inspection and testing services.

D. Arrange with laboratory and pay for additional samples and tests required by Contractor beyond specified requirements.

1.11 SCHEDULE OF INSPECTIONS AND TESTS

A. Section 02223 - Backfilling: Requirements for sampling and testing backfilled materials.

B. Testing required:

1. Modified proctor maximum density determination tests for each soil type.

2. Field in-place density tests at intervals not to exceed 300 ft. on sub-base and base material.

3. Thickness test for asphaltic concrete surfacing and concrete parking. Cores shall be taken at a maximum of 250 ft. The minimum thickness allowed shall be 1/4" less than the required average thickness.

4. Extraction stability and gradation of combine aggregate - one test per 500 tons or part with minimum of one per day. Bitumen content, stability and gradation of aggregate to conform to intent of job mix formula.

5. Provide concrete mix designs as required under Specifications Sections 02520 and 03000.

6. Strength test for each 50 cubic yard of concrete placed.

END OF SECTION 0410

SECTION 01500
TEMPORARY FACILITIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.

B. Temporary utilities required include but are not limited to:

1. Water service and distribution
2. Temporary electric power and light
3. Telephone service
4. Sanitary facilities

C. Temporary construction and support facilities required include but are not limited to:

1. Temporary heat and ventilation as required to facilitate construction process and personnel.
2. Field office and storage sheds.
3. Sanitary facilities, including drinking water.
4. Temporary enclosures.
5. Hoists and temporary elevator use.
6. Temporary project identification signs and bulletin boards
7. Waste disposal services.
8. Rodent and pest control
9. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities required include but are not limited to:

1. Temporary fire protections
2. Barricades, warning signs, lights
3. Sidewalk bridge or enclosure fence for the site.
4. Environmental protection
5. Fencing
6. Barriers

a. Contractor shall be responsible for providing a temporary 6' high chain link construction fence around the front perimeter of the construction site and tie into existing Fence shall be removed upon completion of the job. Limits of construction fence indicate on the site plan drawings.
b. Contractor shall be responsible for providing security measures as required to prevent public entry to construction areas and adjacent properties from damage from construction operations.
c. Contractor shall be responsible for providing a protective barrier around trees and plants designated to remain as indicated in plans. Protect against vehicular traffic, stored materials, dumping, chemically injurious materials and puddling or continuous running water.

7. Enclosures
   a. Provide temporary weather-tight closures of openings in exterior surfaces to provide acceptable working conditions and protection for materials, in allow for temporary heating, and to prevent entry of unauthorized persons. Provide temporary doors with self-closing hardware and locks.
8. Protection of Installed Work
   a. Provide temporary protection for installed products. Control work and traffic in immediate area to avoid damage.
   b. Provide protective coverings at walls, projections, jambs, sills and soffits of openings. Provide barriers or coverings to protect roof and finished floors and stairs from work and traffic, movement of heavy objects and storage.
   c. Prohibit work, traffic and storage on waterproofed and roofed surfaces, and on lawn and landscaped areas that is not a part of the work for those surfaces and areas.
9. Security and Maintenance
   a. Vehicular and pedestrian gates, when indicated or required, shall be securely locked at all times when no work is in progress and when not required for construction activities. During all work hours, gates which must be open shall be continuously monitored by the contractor to prevent unauthorized personnel or vehicles from entering the construction site.
   b. Fencing shall be as specified in 1.02 D above and shall prevent pedestrian travel through the site for any reason.
   c. Temporary fencing shall be removed only for construction reasons. If temporary fencing removal is required for non-construction reasons, fencing shall be immediately replaced and secured as soon as the activity for which its removal was required is completed, or if the activity cannot be completely by the end of the work day, temporary security measures shall be taken by the

Contractor to ensure that there is no breach of security even during off-work periods.

d. "No Trespassing" and similar signs shall be posted at gates and along fencing adjacent to public areas to inform non- construction personnel of the reason for the fence and potential hazards of entering the construction site. Said signs shall be of a size and spacing to be legible from any point along the entire perimeter of the construction site.

1.03 SUBMITTALS

A. Temporary Utilities: Submit reports of tests, inspections, meter readings and similar procedures performed on temporary utilities.

1.04 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations if authorities having jurisdiction, including but to limited to:

1. Building Code requirements
2. Health and safety regulations
3. Utility company regulations
4. Police, Fire Department and Rescue Squad rules
5. Environmental Protection regulations

B. Standards: Comply with NFPA Code 241, Building Construction and Demolition Operations, ANSI-A10 Series standards for Safety Requirements for Construction and Demolition, and NECA Electrical Design Library Temporary Electrical Facilities.

1. Refer to Guidelines for Bid Conditions for Temporary Job Utilities and Services, prepared jointly by AGC and ASC, for industry recommendations.

2. Electrical Services: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.05 PROJECT CONDITIONS

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use for the permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, nor permit them to interfere with progress. Do not allow hazardous dangerous, unsanitary conditions, nor public nuisances to develop or persist on the site.

C. Water Control: Grade site to drain. Maintain excavations free of water. Provide and operate pumping equipment if necessary. Provide silt barriers required by the Florida Department of Transportation St. Johns and any other authority having jurisdiction over the Project.

D. Cleaning During Construction: Control accumulation of waste materials and rubbish so as to maintain a neat, clean and orderly and safe project; periodically dispose of off-site as needed.

Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.

E. Project Identification: Provide a sign if outlined in SECTION 01580 PROJECT SIGN. Locate to provide an unobstructed view from adjoining roadway. Remove project sign upon final completion acceptance.

F. Field Office and Sheds: Office: Weather-tight with lighting, electrical outlets, heating, cooling, and ventilating equipment, and equipped with furniture.

Storage Sheds for Tools, Materials, and Equipment: Weather-tight with adequate space for organized storage and access, and lighting for inspection of stored materials.

Contractor provide 10 x 8 minimum size office with plan table, telephone, heat, a/c for projects exceeding 10,000 sq. ft. building area.

G. Protection of Adjacent Properties: Locate on site construction operations that will generate noise and/or dust as far as practical from occupied structures on adjacent properties so as to minimize disturbances to the occupants of these structures or properties.

Prevent dust or other contaminants caused by construction operations for this Project from being carried to adjacent properties by installation of protective barriers and/or suspension of construction operations during high winds.

Dispose of all construction debris which may be carried to adjacent properties by winds. Remove debris daily and/or more often as required to prevent contamination of adjacent properties.

H. Removal: Remove temporary materials, equipment and construction facilities prior to Substantial Completion inspection.

Remove temporary utility services prior to Final Completion Inspection. Clean

and repair damage caused by installation or use of temporary facilities. Remove underground installations; grade and complete all work on site as indicated.

I. Conversion to Public Utilities: General Contractor is to coordinate and arrange with the appropriate utility service providing agencies and make arrangements for the installation and connection to final utilities prior to Final Completion inspection.

General Contractor shall provide any and all coordination, scheduling and layouts as may be required by the service utilities.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Provide new materials; of acceptable to the Project Manager, undamaged previously used materials in serviceable condition maybe used. Provide materials suitable for the use intended.

B. Lumber and Plywood: Comply with requirements in Division 6 Section Rough Carpentry.

1. For job-built temporary offices, shops and sheds within the construction area, provide UL labeled, fire treated lumber and plywood for framing, sheathing and siding.

2. For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1 of sizes and thickness indicated.

3. For fences and vision barriers, provide exterior type, minimum 3/8" thick plywood.

4. For safety barriers, sidewalk bridges and similar uses, provide minimum 5/8" thick exterior plywood.

C. Paint: Comply with requirements of Division 9 Section Finish Painting.

1. For job-built temporary offices, shops, sheds, fences and other exposed lumber and plywood, provide exterior grade acrylic-latex emulsion over exterior primer.

2. For sign panels and applying graphics, provide exterior grade alkyd gloss enamel over exterior primer.

3. For interior walls of temporary offices, provide two coats interior latex flat wall paint.

D. Tarpaulins: Provide waterproof, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosure provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.

E. Water: Provide portable water approved by local health authorities. F.

Open-Mesh Fencing: Provide 11-gage, galvanized 2-inch, chain link fabric fencing 6-feet high with galvanized barbed wire top strand and galvanized steel pipe post, 1" I.D. for line posts and 2” I.D. for corner posts.

2.02 EQUIPMENT

A. General: Provide new equipment: if acceptable to the Project Manager, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. Water Hoses: Provide 3/4" heavy-duty, abrasion-resistant, flexible rubber hoses 100 ft. Long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shut-off nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide

receptacle outlets equipped with ground-fault circuit interrupters, reset bottom and pilot light, for connection of power tools and equipment.

D. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide water proof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.

E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the type of fuel being consumed.

G. Temporary Offices: Provide prefabricated or mobile units or similar job- built construction with lockage entrances, operable windows and serviceable finished. Provide heated and air-conditioned units on foundations adequate for normal loading.

H. Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.

I. First Aid Supplies: Comply with governing OSHA and any other regulations.

J. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable UL-rated, class ABC dry chemical extinguishers, or a combination of extinguishers of NEPA recommended classes for the exposures.

1. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

PART 3 EXECUTION

3.01 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the project adequately and result in minimum interference with performance of the work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.

1. Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connections for temporary services.

2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.

3. Obtain easements to bring temporary utilities to the site, where the Owner's easements cannot be used for that purpose.

4. Use Charges: Cost of use charges for temporary facilities are not chargeable to the Owner or Architect, and will not be acceptable as a basis of claims for a Change Order.

B. Water Service: Install water service and distribution piping of sized and pressures adequate for construction until permanent water service is in use.

C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters and main distribution switch gear.

D. Temporary Lighting: Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.

1. Install and operate temporary lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for construction operations and traffic conditions.

E. Temporary Telephones: Provide temporary telephone service for all personnel engaged in construction activities, throughout the construction period. Install telephone on a separate line for each temporary office and first aid station. Where an office has more than two occupants, install a telephone for each additional occupant or pair of occupants.

1. At each telephone, post a list of important telephone numbers. F.

Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge or effluent, provide containers to remove and dispose of effluent off the site in a lawful manner.

1. Filter out excessive amounts of soil, construction debris, chemicals, oils and similar contaminants that might clog sewers or pollute waterways before discharge.

G. Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by run-off of storm water from heavy rains.

3.03 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION A.

Locate field offices, storage sheds, sanitary facilities land other temporary construction and support facilities for easy access.

1. Maintain temporary construction and support facilities until Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

B. Provide incombustible construction for offices, shops and sheds located within the construction area or within 30 feet of building lines. Comply with requirements of NFPA 241.

C Temporary Heat: Provide temporary heat required by construction activities, for curing or drying of completed installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

D. Heating Facilities: Except where use of the permanent system is authorized, provide electric vented self-contained LP gas or fuel oil heaters with individual thermostatic control.

1. Use of gasoline-burning space heaters, open flame, or salamander type heating units is prohibited.

E. Storage and Fabrication Sheds: Install storage and fabrication sheds, sized, furnished and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds maybe open shelters or fully enclosed spaces with the building or elsewhere on the site.

F. Temporary Paving: Construct and maintain temporary roads and paving to support the indicated loading and to withstand exposure to traffic during the construction period. Locate temporary paving the roads, storage areas and parking where the same permanent facilities will be located. Review proposed modifications to permanent paving with the Architect.

1. Paving: Comply with Division 2 Section 02500 Asphalt Concrete Paving and Resurfacing for construction and maintenance of temporary paving.

2. Coordinate temporary paving development with subgrade grading, compaction, installation and stabilization of sub-base, and installation of base and finish courses of permanent pavings.

3. Install temporary paving to minimize the need to rework the installations and to result in permanent reads and paved areas that are without damage or deterioration when occupied by the Owner.

4. Delay installation of the final course of permanent asphalt concrete paving until immediately before Substantial Completion. Coordinate with either conditions to avoid unsatisfactory results.

5. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration and supervision.

G. Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.

1. Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used material.

H. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted. Provide one toilet for each 15 workers on site and have serviced weekly as a minimum.

I. Wash Facilities: Install wash facilities supplied with portable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.

1. Provide safety showers, eye-wash fountains and similar facilities for convenience, safety and sanitation of personnel.

J. Drinking Water Fixtures: Provide drinking water fountains including paper supply.

1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 degree F (7 to 13 degree C).

K. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division 2 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations and construction free of water.

L. Temporary Enclosures: Provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.

1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.

3. Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.

4. Where temporary wood or plywood enclosure exceeds 100 square feet in area, use UL-labeled fire-retardant treated material for framing and main sheathing.

M. Temporary Lifts and Hoist: Provide facilities for hoisting materials and employees. Truck cranes and similar devices used for hoisting material are considered □tools and equipment□ and not temporary facilities.

N. Temporary Elevator Use: Refer to Division 14 □Elevator□ Sections.

O. Project Identification and Temporary Signs: Prepare project identification and other signs of the size indicated□ install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative treated wood or steel. Do not permit installation of unauthorized signs.

1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details indicated.

2. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.

P. Temporary Exterior Lighting: Maintain exterior yard and sign lights so that signs are visible when work is being performed.

Q. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days

when the temperature is expected to raise above 80 degree F (27 degree). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of materials in a lawful manner.

R. Rodent and Pest Control: Before foundation work has been completed, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches and other pests. Employ this service

to perform extermination and control procedures at regular intervals so the project will be relatively free of pests and their residues at Substantial Completion. Perform control operations
in a lawful manner using environmentally safe materials.

3.04 SECURITY AND PROTECTIONS FACILITIES INSTALLATION

A. Except for use of permanent fire protection as soon as available do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer as requested by the Project Manager.

B. Temporary Fire Protection: Until fire protection needs are supplied by permanent facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 Standard for Portable Fire Extinguishers, and NFPA 141 Standard for Safeguarding Construction, Alternations and Demolition Operations.

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.

2. Store combustible materials in containers in fire-safe locations.

3. Maintain unobstructed access in fire extinguishers, fire hydrants, temporary file protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.

4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.

C. Permanent Fire Protection: At the earliest feasible date in each area of the Project, complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

D. Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting including flashing red or amber lights.

E. Enclosure Fence: When excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations.

Install in a manner that will prevent people, dogs and other animals from easily entering the site, except by the entrance gates.

1. Provide open-mesh, chain-link fencing with posts set in a compacted mixture of gravel and earth.

F. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security.

1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of materials to minimize the opportunity for theft and vandalism.

G. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possible that air, waterways and sub-soil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which product harmful poise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.05 OPERATION, TERMINATION AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24 hour day basis where required to achieve indicated results and to avoid possibility of damage.

2. Protection: Prevent water filled piping from freezing. Maintain makers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than

substantial completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves the right to take possession of Project identification signs.

2. Remove temporary paving that is not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that does not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other

   petrochemical compounds, and other substances which might impair growth of plant materials or lawns. Repair or replace street pavings, curbs and sidewalks at the temporary entrances, as required by the governing authority.

3. At Substantial Completion, clean and renovate permanent facilities that have been used during the construction period, including but not limited to:
   a. Replace air filters and clean inside of ductwork and housings.
   b. Replace significantly worn parts and parts that have been subject to unusual operating conditions.
   c. Replace lamps that are burned out or noticeably dimmed by substantial hours of use as noted by the Owner's representative.

END OF SECTION 01500

SECTION 01600
MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

B. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section 01300 -Submittals.

C. Standards: Refer to Section “Reference Standards and Definitions” for applicability of industry standards to products specified.

D. Administrative procedures for handling requests for substitutions made after award of the Contract are included under Section 01300 Product Substitution.

1.03 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents such as specialties, systems, structure, finishes, accessories, and similar terms. Such terms are self-explanatory and have well recognized meanings in the construction industry.

1. Products are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term “Product” includes the term material, equipment, system and terms of similar intent.

a. Named Products are items identified by manufacturer’s product name, including make or model designation, indicated in the manufacturer’s published product literature, that is current as of the date of the Contract Documents.

b. Foreign Products, as distinguished from domestic products, are items substantially manufactured (50 percent or more of value) outside of the United States and its possessions; or produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens nor living within the United States and its possessions.

2. Materials are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the work.

3. Equipment is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.04 SUBMITTALS

A. Product List Schedule: Prepare a schedule showing products specified in a tabular form acceptable to the Project Manager. Include generic names of products required. Include the manufacturer's name and proprietary product names for each item listed.

1. Coordinate the product list schedule with the Contractor's Construction Schedule and the Schedule of Submittals. a. Related Specification Section Number
   b. Generic name used in Contract Documents
   c. Proprietary name, model number and similar designations. d. Manufacturer's name and address
   e. Supplier's name and address
   f. Installer's name and address
   g. Projected delivery date, or time span of delivery period.

2. Initial Submittal: Within 30 days after date of commencement of the work, submit 3 copies of an initial product list schedule. Provide a written explanation for omissions of data, and for known variations from Contract requirements.

   a. At the Contractor's option, the initial submittal may be limited to product selections and designations that must be established early in the Contract period.

3. Complete Scheduled: Within 45 days after date of commencement of the Work, submit 3 copies of the completed product list schedule. Provide a written explanation for omissions of data, and for known variations from Contract requirements.

4. Architect's Action: The Architect will respond in writing to the Contractor within 2 weeks of receipt of the completed product list schedule. No response within this time period constitutes no objection to listed manufacturers on products, but does not constitute a waiver of the requirement that products comply with Contract Documents. The Architect's response will include the following:

   a. A list of unacceptable product selections, containing a brief explanation of reasons for this action.

1.05 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.

B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on accessible surface that is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data.

a. Name of product and manufacturer b. Model and serial number
c. Capacity
d. Speed
e. Ratings
f. Additional pertinent information

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deteriorating and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.

3. Deliver products to the site in the manufacturer's original sealed container of other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.

4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.

6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.

7. Store products subject to damage by the elements above ground, under cover in a weather tight enclosure, with ventilation adequate in prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 PRODUCTS

2.01 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.

1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.

2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situation on other projects.

B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous project experience. Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.

a. Where products or manufacturers are specified by name, accompanied by the term “or equal” or “or approved equal” comply with the Contractor Document provisions concerning substitutions to obtain approval for use of an unnamed product.

2. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of those products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning substitutions to obtain approval for use of an unnamed product.

3. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.

4. Performance Specification Requirements: Where Specifications require compliance with performance requirements,

provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated.

a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.

5. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.

6. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.

a. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning □substitutions□ for selection of a matching product in another product category, or for noncompliance with specified requirements.

7. Visual Selection: Where specified product requirements include the phrase ... as selected from manufacturer's standard colors, pattern, textures... or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern and texture from the product line selected.

8. Asbestos free materials: No products containing asbestos shall be used for any part of the work for this product. Provide verification.

PART 3 EXECUTION

3.01 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each project securely in place, accurately located and aligned with other work.

1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01600

SECTION 01631
PRODUCT SUBSTITUTIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for handling request for substitutions made during bidding and after award of the Contract.

B. The Contractor's Installation Schedule and the Schedule of Submittals are included under Section Submittals.

C. Standards: Refer to Section Definitions and Standards for applicability of industry standards to products specified.

D. Procedural requirements governing the Contractor's selection of products and product options are included under Section Materials and Equipment.

1.03 DEFINITIONS

A. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Requests for changes in products, materials, equipment, and methods of installation required by Contract Documents proposed by the Contractor during bidding and after award of the Contract are considered requests for substitutions. The following are not considered substitutions:

1. Only substitutions requested by Bidders during the bidding period, and accepted prior to bid opening and award of Contract, are considered as included in the Contract Documents and are not subject to requirements specified in Section for substitutions.
2. Revisions to Contract Documents requested by the Owner or Architect.
3. Specified options of products and installation methods included in Contract Documents.

4. The Contractors determination of and compliance with governing regulations and orders issued by governing authorities.

1.04 SUBMITTALS

A. Substitution Request Submittal: Request for substitution will be considered if received within thirty five (30) days after commencement of the Work. As long as this time allowance will not impact the construction schedule.

1. Submit three (3) copies of each request for substitution for consideration. Submit requests in the form and in accordance with procedures required for Change Order proposals.

2. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitution, and the following information, as appropriate:
   a. Product Data, including Drawings, and descriptions of products, fabrication and installation procedures.
   b. Samples, where applicable or requested.
   c. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.
   d. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors, that will become necessary to accommodate the proposed substitution.
   e. A statement indicating the substitutions effect on the Contractor's construction schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
   f. Cost information, including a proposal of the net change, if any in the Contract Sum.
   g. Certification by the Contractor that the Substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the contractor's waiver of rights to additional payment or time, that may subsequently become necessary because of the failure of the substitution to perform adequately.

3. Architect's Action: Within two weeks of receipt of the request for substitution, the Architect will request additional information or documentation necessary for evaluation of the request if needed. Within two (2) weeks of receipt of the request, or one week of receipt of the additional information or documentation, whichever is later, the Architect will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the project specified by name. Decision on the use of a product substitution or its rejection by the Architect is considered final. Acceptance will be in the form of a Change Order.

2.01 SUBSTITUTIONS

A. Conditions: The Contractor's substitution request will be received and considered by the Architect when one or more of the following conditions are satisfied; otherwise request will be returned without action except to record noncompliance with these requirements.

1. Extensive revisions to Contract Documents are not required.

2. Proposed changes are in keeping with the general intent of Contract Documents.

3. The request is timely, fully documented and properly submitted.

4. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the work promptly or coordinate activities properly.

5. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.

6. A substantial advantage is offered to the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar consideration.

7. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.

8. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.

9. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.

B. The Contractor's submittal and Project Manager's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

C. Substitution request constitutes a representation that the Contractor:

1. Has investigated proposed product and determined that it meets or exceeds, in all respects, specified product.

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

3. Will coordinate installation and make other changes which may be required for work to be complete in all respects.

4. Waives claims for additional costs which may subsequently become apparent. All costs associated with the substitution will be paid by the Contractor regardless of approvals given, and regardless of subsequent difficulties experienced as a result of substitutions.

END OF SECTION 01631

SECTION 01700
PROJECT CLOSE-OUT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.01 SUMMARY

A. This Section specifies administrative and procedural requirements for project close-out, including but not limited to:

1. Inspection procedures
2. Project record document submittal. (substantial completion requirements)
3. Operating and Maintenance Manual Submittal (substantial completion requirements).
4. Submittal of warranties (substantial completion requirement).
5. Final cleaning

B. Close-out requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.

C. Final Payment to be made when the County has received all required close-out documents.

1.03 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for Certification of Substantial Completion, complete the following: List exceptions in the request.

1. In the Application for Payment that coincided with, or first follows, the date Substantial Completion in claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.

a. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the work is not complete.

2. Advise Owner of pending insurance change-over requirements.

3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.

4. Obtain and submit releases enabling the Owner unrestricted use of the work and access to services and utilities; include occupancy permits, operating certificates and similar releases.

5. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, the Project Manager will either proceed with inspection or advise the Contractor of unfilled requirements. The Project Manager will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. Results of the completed inspection will form the basis of requirements for final acceptance.

2. Should the project fail to meet the standards required for Substantial Completion as defined in the documents, the Contractor will pay the expense of a second inspection by the Architect/Consultants and the Owner. Cost will be deducted from the Contractor's retainage.

1.04 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following list exceptions in the request:

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and complete operations where required.

2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.

3. Submit a certified copy of the Architect or Owner's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Project Manager.

4. Submit final meter readings for utilities, a measured record of stored fuel and similar data as of the date of Substantial Completion, or when the Owner took possession of the responsibility for corresponding elements of the Work.

5. Submit consent of surety to final payment.

6. Submit a final liquidated damages settlement statement

7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Re-inspection Procedure: The Architect will re-inspect the work upon receipt of notice that the work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Architect.

1. Upon completion of re-inspection, the Architect will prepare a certification of final acceptance, or advise the contractor of work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

1.05 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposed; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Architect’s reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation; where the installation varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the

Contract Drawings: Give particular attention to concealed elements that would be difficult to measure and record at a later date. Provide for project photographs if deemed necessary by Owner's representative.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the work.

2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.

3. Note related Change Order numbers where applicable.

4. Organize record drawing sheets, and print suitable titles, dates and other identification on the cover of each set.

5. Provide three (3) additional sets of black line drawing sets of As-Built Drawings.

C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual work performed in comparison with the text of the specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Project Data.

1. Upon completion of the Work, submit record Specifications to the Architect for the Owner's records.

D. Record Project Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variation in actual work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark-up of record drawings and Specifications.

1. Upon completion of mark-up, submit complete set of record Product Data in the three-ring binder (indexed) to the Architect for the Owner's records.

E. Record Sample Submitted: Immediately prior to the date or dates of substantial completion, the Contractor will meet at the site with the Architect and the Owner's personnel to determine which of the submitted Samples that have been maintained during progress of the work are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's Sample storage area.

F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the work. Immediately prior to the date or dates of substantial completion, complete miscellaneous record and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Project Manager for the Owner's records.

G. Maintenance Manuals: Organize operating and maintenance data into five (5) suitable sets of manageable size. Bind properly indexed data in individual heavy-duty 2-inch, 3-ring vinyl covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:

1. Emergency instructions
2. Spare parts list
3. Copies of warranties
4. Wiring diagrams
5. Recommended turn-around cycles
6. Inspection procedures
7. Shop Drawings and Product Data
8. Fixture lamping schedule

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.01 CLOSE-OUT PROCEDURES

A. Operating and Maintenance Instructions: Arrange for each installer of equipment that required regular maintenance to provide Operating and Maintenance Instructions. If installers are not experienced in procedures, provide instructions by manufacturer's representatives. All items to be provided or completed prior to Certificate of Substantial Completion must be issued by the Owner. Include a detailed review of the following items:

1. Maintenance manuals
2. Record documents
3. Spare parts and materials
4. Tools

5. Lubricants
6. Fuels
7. Identification systems
8. Control sequences
9. Hazards
10. Cleaning
11. Warranties and bonds
12. Maintenance agreements and similar continuing commitments
13. On-site instructions to County maintenance personnel on major systems operations such as HVAC as per technical specifications.

B. As part of instruction for operating equipment, demonstrate the following procedures, prior to the Owner issuing Certificate of Substantial Completion:

1. Start-up
2. Shutdown
3. Emergency operations
4. Noise and vibration adjustments
5. Safety procedures
6. Economy and efficiency adjustments

3.02 PROJECT CLOSE-OUT MANUALS AT SUBSTANTIAL COMPLETION

A. Submit Project Close-out Manuals prior to issuance of final application for payment. Provide three (3) copies.

B. Bind in commercial quality 8 ½” x 11" three-ring binder, indexed with hardback, cleanable, plastic covers.

C. Label cover of each binder with typed title PROJECT CLOSE-OUT MANUAL, with title of project; name, address, and telephone number of Contractor and name of responsible Principal.

D. Provide table of contents: Neatly typed, in the following sequence:

1. Final Certificate of Occupancy
2. Warranty Service Subcontractors Identification List
3. Final Lien Waivers and Releases
4. Warranties and Guarantees
5. Systems Operations and Maintenance Instruction
6. Manufacturer’s Certificates and Certifications
7. Maintenance Service Contracts
8. Spare Parts Inventory List
9. Special Systems Operating Permits or Approvals
10. Asbestos free materials notarized statement

E. Provide all documents for each section listed. List individual documents in each section in sequence of the Table of Contents of the Project Manual.

F. Identify each document listed in the Table of Contents with the number and title of the specification section in which specified, and the name of the product or work item.

G. Separate each section with index to sheets that are keyed to the Table of Contents listing.

H. Warranty Service Subcontractors List shall identify subcontractor supplier, and manufacturer for each warranty with name, address and emergency telephone number.

3.03 FINAL CLEANING

A. General: General cleaning during construction is required by the General Conditions and included in Section 01500 – Temporary Facilities

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

a. Remove labels that are not permanent labels.
b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
c. Clean exposed exterior and interior hard-surfaced finished to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
e. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface. Remove waste and surplus materials from the site in an appropriate manner.

C. Pest Control: Engage an experienced exterminator to make a final inspection, and rid the Project of rodents, insects and other pests.

D. Removal of Protection: Remove temporary protection and facilities installed for protection of the work during construction.

E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remaining after completion of associated work have become the Owner's property, arrange for disposition of these materials as directed.

END OF SECTION 01700

SECTION 01740
WARRANTIES AND BONDS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contractor Documents, including manufacturer's standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.

2. General close-out requirements are included in Section Project Close-Out.

3. Specific requirements for warranties for the work and products and installations that are specified to be warranted, are included in the individual Sections of Division 2 through 16.

4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties to not relieve the Contractor of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.03 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.

B. Reinstatement of Warranty. When work covered by a warranty has failed

and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents.

D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligation, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligation, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

E. The Owner reserves the right to refuse to accept work for the Project where a special warranty, certification, or similar commitment is required on such work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.04 WARRANTY PERIOD

A. The Contractor shall participate with the County and the Architect's representative, at the beginning of the tenth month of the warranty period, in conducting an on-site review and evaluation of all items of equipment, materials and workmanship covered by the warranties and guarantees. Contractor shall act promptly and without cost to the County to correct all defects, problems, or deficiencies determined as such by the Architect/Owner during on the site review.

B. All warranties and guarantees shall commence on the date of Substantial Completion except for items which are determined by the County to be incomplete or a non-comply status at the time of Substantial Completion. The coverage commencement date for warranties and guarantees of such work shall be the date of the County's acceptance of that work.

C. Warranty period shall be manufacturer's standard for product specified except where specific warranty periods are specified in individual sections. But in no case less than one year.

1.05 SUBMITTALS

A. Submit written warranties to the Owner prior to the date certified for Substantial Completion. If the Architect's Certificate of substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the work, submit written warranties upon request of the Project Manager.

1. When a designated portion of the work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Project Manager within fifteen days of completion of that designated portion of the work.

B. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepared a written document that contains appropriate terms and identification, ready for executing by the required parties. Submit a draft to the Architect for approval prior to final execution.

1. Refer to individual Sections of Division 2 through 16 for specific content requirements, and particular requirements for submittal of special warranties.

C. Form of Submittal: At Final Completion compile two (2) copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

D. Bind (3) three sets of warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8 ½" by 11" paper.

1. Provide heavy paper dividers with Celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.

2. Identify each binder on the front and the spine with the typed or printed title WARRANTIES AND BONDS, the Project title or name, and the name of the Contractor.

3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 PRODUCTS (Not applicable)

PART 3 EXECUTION

3.01 ELECTRONIC CLOSE-OUT DVD

I. At the completion of the project, submit one copy of a DVD with entire project close out information below in PDF format. All letter, legal and brochure size sheets shall be portrait and the As-build drawings will be landscape. All fonts will be Arial. All items will be in PDF with OCR (Optical Character Recognition). This will enable a search engine to identify words on the scanned documents.

1. Contacts: Set up a separate PDF for the contacts. No bookmarks are needed for this section.
2. As-Builts: All as-built drawings will be landscape.
3. Submittals: All technical submittal items (approved and approved as noted) will be provided and sorted by the 16 standard divisions. Bookmarks will be needed for the appropriate divisions.
4. Operations and Maintenance Manual: Specify the division name only in the bookmarks (1-16). Please note that all items will be in PDF with OCR (Optical Character Recognition). This will enable a search engine to identify works on the scanned documents.
5. Permitting: This should include the Certificate of Occupancy and any other document that the Project Manager may include pertaining to the permitting for the project.

END OF SECTION 01740

Division 2
Site Construction

SECTION 02210
SITE PREPARATION AND EARTHWORK

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. Furnish all necessary labor, equipment, material, transportation and performing all work necessary to clear the construction site and bring the site, including roads, drives, building sites, paved areas and open areas to the lines and grades shown on drawings.

B. Related Sections: The following sections contain requirements that related to this section.

1. Section 02220 - Excavating, Backfilling and Compacting

2. Section 02500 - Asphalt Concrete Pavement and Resurfacing

3. Section 02650 - Water Distribution System

4. Section 02710 - Concrete Sidewalk

5. Section 02720 - Storm Drainage System

6. Section 02730 – Sanitary Sewerage System

7. Section 02810 – Chain Link Fences and Gates

8. Section 03100 - Concrete Formwork

9. Section 03300 - Cast-in-Place Concrete

1.03 REFERENCED STANDARDS AND TESTS

A. AASHTO T180 (ASTM D1557), Moisture-Density Relations of soils Using a 10 lb. Rammer and an 18 in. Drop.

B. AASHTO T191 (ASTM D1556), Density of soils in Place by Sand-Cone Method.

C. AASHTO T238 (ASTM D2922), Density of Soils and Soil-Aggregates in Place by Nuclear Method.

D. AASHTO M 145 (ASTM D3282), Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.

1.04 QUALITY ASSURANCE

A. Field Engineering: Provide the services of a Professional Land Surveyor registered in the State of Florida to establish all vertical and horizontal controls required for layout of the work and for preparation of a certified survey showing recorded finish elevations and dimensions upon completion of site preparation and earthwork.

B. Water Pollution: Comply with the applicable provisions of permits issued by Water Management District and Orange County Public Works. Protect adjacent waterways from contamination and increased turbidity due to Contractor's operations by all means necessary, including the installation of silt or turbidity screens, filter blankets, temporary dikes and ditches, etc., and limit runoff water from disturbed areas as necessary to meet requirements and restrictions of the agencies having jurisdiction.

C. Fill Materials: Submit certifications that fill materials furnished meet the specified requirements and standards.

D. Compaction: During the filling operation, and unless otherwise required by Owner, take at least one density test per 5,000 square feet in pavement/roadway areas and building sites for each lift above water level and one density test per 25,000 square feet for each lift in other areas. If any test fails, rework and recompact the area and retest, until satisfactory compacting meeting the specified requirements are achieved.

PART 2 - PRODUCTS

2.01 MATERIALS FOR FILLS

A. Suitable for Fills: Material classified as A-1, A-3, or A-2-4 under AASHTO M 145 (ASTM D3282), free from vegetation and organic material, and with not more than 10 percent by weight passing the No. 200 sieve.

B. Suitable For Place In Water: Material classified as A-1 or A-3 under AASHTO M-145 (ASTM D 3282).

C. Unsuitable For Fills: Materials classified as A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7 and A-8 under AASHTO M 145 (ASTM D3282).

D. Select Material: suitable material containing no pieces or rock fragments larger than will pass a 3-inch diameter ring.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clearing and Grubbing:

1. Completely remove and dispose of all trees, brush, stumps, roots, grass, weeds, rubbish and all other obstructions resting on or protruding through the surface of the existing ground and the surface of excavated areas.

2. Clear and grub within all areas of the roadway right-of-way, and all areas designated for site grading except where selective clearing will be transformed in some areas by retaining selected trees as designated on the Drawings or directed by Owner. Protect from damage by construction equipment and in a manner approved by Owner, all trees selected by the Owner for saving.

3. Within building sites and paved areas, remove to a depth of not less than 2-feet below the surface all stumps, roots, etc., protruding through or appearing on the surface of the existing ground and completed excavations, and replace with compacted backfill before the area is filled.

4. Within all other areas designated for clearing and grubbing, remove to a depth of 1-foot below the completed surface all stumps, roots, and other debris projection through or appearing on the surface of the ground.

5. Strip grass and roots to a depth of 4-inches from all areas to be excavated or filled upon. Stockpile for later use stripped material suitable for topsoil and dispose of all other material as directed by Owner.

B. Debris Disposal: Prior to excavation and/or filling, remove from the project site and dispose of all clearing and grubbing debris and other accumulated trash.

3.02 PERFORMANCE

A. Excavation:

1. Perform excavation to the limits indicated on the plans or specified herein, including shaping and sloping and other work necessary in bringing the earthwork to the required grades, alignment and cross sections.

2. As far as practicable, use all suitable materials removed from the excavation in the formation of the embankments, subgrades, shoulders, building sites and other places as directed. Remove unsuitable material to the required depth and replace it with suitable material to the satisfaction of Owner. Unsuitable material existing in open areas may remain, and these open areas may be used for disposal areas for the unsuitable material as directed by Owner.

3. Dispose of excess excavated suitable material as directed by Owner and excess unsuitable excavated material outside the limits of the project.

4. In the event materials containing toxic substances, oil products or other pollutants are encountered during excavation, immediately cease operations and notify Owner. Proceed with the excavation only when so directed by Owner,

using additional procedures and precautions, if any, as necessary to contain and dispose of the contaminated material in compliance with all applicable laws and regulations.

B. Fills:

1. Construct fills of suitable material placed in layers of not more than 8-inches in depth measured loose and rolled and/or vibrated with suitable equipment until compacted. Thickness of layers may be increased provided the equipment and methods used are proven by field density testing to be capable of compacting thicker layers to specified densities. Decrease layer thickness if equipment and methods used prove to be incapable of compacting layers to specified densities.

2. Place no material that will not pass through a 6-inch diameter ring within the top 12-inches of the surface of the completed fill, and none that will not pass through a 3-inch diameter ring within the top 4-inches of the completed fill. Do not use broken concrete or asphaltic pavement in fills.

3. Compact fill within the roadways, walkways, parking areas, and building sites to a density of not less than 95 percent of its maximum density as determined by AASHTO T 180 (ASTM D 1557), and fill within other areas to a density of not less than 90 percent.

4. Muck, marl or other unsuitable material may be used in open areas designated in the Drawings or as directed by Owner, disc and harrow this layer to break up large pieces of material. Compaction of unsuitable material will not be required.

5. Place and compact fills to within 0.1-foot of the required elevations and slope surfaces to drain as shown on the Drawings.

C. Subgrades:

1. Construct subgrades for paved areas to conform to the grades, lines and cross sections shown on the drawings, of uniform density, ready to receive the base course.

2. Stabilize, in accordance with Section 02240, Stabilized Subgrade, all materials of the subgrade which provide a Limerock Bearing Ratio of less than 40.

3. After the subgrade has been properly shaped, and stabilized if required, bring the surface to a firm, unyielding surface by rolling the entire area with an approved vibratory roller. Compact all areas inaccessible to the roller with hand tampers weighing not less than 50 pounds, and with face area not more than 100-square-inches. Unless the subgrade material at the time of the rolling contains sufficient moisture to insure proper compaction, add water as directed before compacting. Allow subgrade material containing excess moisture, as determined by Owner, to dry to the proper consistency before being compacted.

4. Compact the top 12-inches of the subgrade, including cut and fill sections, to a density of not less than 95 percent of the maximum density as determined by the AASHTO T 180 (ASTM D 1557).

5. After the subgrade has been prepared, maintain it free of ruts, depressions and damage resulting from the hauling and handling of any material, equipment, tools, etc. Provide and maintain ditches or drains along the completed subgrade section to prevent damage by storm water. Just before the base course is laid, check the subgrade to conform with designed crown and elevation. Complete the subgrade to provide a final elevation within 0.1-foot of the required elevation.

END OF SECTION

SECTION 02220
EXCAVATING, BACKFILLING, AND COMPACTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. The work included under this Section consists of clearing, excavating, grading and backfilling as required for the construction of building pads, roadways, and utility systems consisting of, but not limited to, water mains, sanitary sewers, manholes, drainage structures, ponds, swales and appurtenances and irrigation lines as shown on Drawings and specified herein.

B. Related Sections: The following sections contain requirements that related to this section.

1. Section 02210 – Site Preparation and Earthwork

C. Definitions:

1. Maximum Density: Maximum weight in pounds per cubic foot of a specific material.

2. Optimum Moisture: Percentage of water in a specific material at maximum density.

3. Suitable: Suitable materials for fills shall be a non-cohesive, non-plastic granular local sand and shall be free from vegetation, organic material, marl, silt or muck. The Contractor shall furnish all additional fill material required.

4. Unsuitable: Unsuitable materials are highly organic soil (peat or muck) classified as A-8 in accordance with AASHTO Designation M 145.

D. Plan for Earthwork: The Contractor shall be responsible for having determined to his satisfaction, prior to the submission of his bid, the conformation of the ground, the character and quality of the substrate, the types and quantities of materials to be encountered, the nature of the groundwater conditions, the prosecution of the work, the general and local conditions and all other matters which can in any way affect the work under this Contract.

1.03 QUALITY ASSURANCE

A. A Testing Laboratory employed by Owner will make such tests as are deemed advisable. The Contractor shall schedule his work so as to permit a reasonable time or testing before placing succeeding lifts and shall keep the laboratory informed of his progress. Costs for all testing shall be paid by the Owner. However, any and all test which have to be repeated because of the failure of the tested materials to meet specification shall be paid for by Contractor and the cost of any tests shall be deducted from payments due to Contractor.

1.04 JOB CONDITIONING

A. Test borings made on the site and the surface exploration data are available upon request and are for the Contractor's information only.

B. If, in the opinion of Owner, conditions encountered during construction warrant a change in footing elevations, or in the depth of removal of unsuitable material from that indicated on the Drawings, an adjustment will be made in the contract price.

1.05 PROTECTION

A. Sheeting and Bracing:

1. Furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures, power poles, etc. from undermining, and to protect workers from hazardous conditions or other damage. Such support shall consist of braced steel sheet piling, braced wood lagging and soldier beams or other approved methods. If Owner is of the opinion that at any points sufficient or proper supports have not been provided, he may order additional supports put in at the expense of Contractor, and compliance with such order shall not relieve or release Contractor from his responsibility for the sufficiency of such supports. Where soils cannot be properly compacted to fill a void, lean concrete shall be used as backfill at no additional expense to Owner.

2. The Contractor shall construct the sheeting outside the neat lines of the foundation unless indicated otherwise to the extent he deems it desirable for his method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall be adequate to withstand all pressure to which the structure or trench will be subjected. Any movement or bulging which may occur shall be corrected by Contractor at his own expense so as to provide necessary clearances and dimensions.

3. Where sheeting and bracing is required to support the sides of excavations for structures, Contractor shall engage a Professional Geotechnical Engineer, registered in the State of Florida, to design the sheeting and bracing. The sheeting and bracing installed shall be in conformity with the design, and certification of this shall be provided by the Professional Engineer.

4. The installation of sheeting, particularly by driving or vibrating, may cause distress to existing structures. The Contractor shall evaluate the potential for such distress and, if necessary, take all precautions to prevent distress of existing structures because of sheeting installation.

5. The Contractor shall leave in place to be embedded in the backfill all sheeting and bracing not shown on the Drawings but which Owner may direct in writing to leave in place at any time during the progress of the work for purpose of preventing injury to structures, utilities, or property, whether public or private. Owner may direct that timber used for sheeting and bracing be cut off at any specified elevation.

6. All sheeting and bracing not left in place shall be carefully removed in such a manner as not to endanger the construction or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, or otherwise as may be directed by Owner.

7. The right of Owner to order sheeting and bracing left in place shall not be construed as creating any obligation on this part to issue such orders, and his failure to exercise his right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

8. No wood sheeting is to be withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any wood sheeting be cut off at a level lower than 1 foot above the top of any pipe.

B. Pumping and Drainage:

1. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills, structures or pipes to be built thereon have been completed to such an extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels. The Contractor shall engage a Geotechnical Engineer registered in the State of Florida, to design the dewatering systems for all structures. The Contractor shall submit to Owner for review a plan for dewatering systems prior to commencing work. The dewatering system installed shall be in conformity with the overall construction plan, and certification of this shall be provided by the Professional Engineer. The Professional Engineer shall be required to monitor the performance of the dewatering systems during the progress of the work and required such modifications as maybe required to assure that the systems are performing satisfactorily.

2. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation and to preserve the integrity of adjacent structures. Well or sump

installations shall be constructed with proper sand filters to prevent drawing of finer grained soil from the surrounding ground.

3. Water entering the excavation from surfaces runoff shall be collected in the shallow ditches around the perimeter of the excavation, drained to sumps, and pumped from the excavation to maintain a bottom free from standing water.

4. The Contractor shall take all additional precautions to prevent uplift of an structure during construction.

5. The conveying of water in open ditches or trenches will not be allowed. Permission to use any storm sewers, or drains, for water disposal purposes shall be obtained from the authority having jurisdiction. Any requirements and costs for such use shall be the responsibility of the Contractor. However, the Contractor shall not cause flooding by overloading or blocking up the flow in the drainage facilities, and he shall leave the facilities unrestricted and as clean as originally found. Any damage to facilities shall be repaired or restored as directed by Owner or the authority having jurisdiction, at no cost to Owner.

6. Flotation shall be prevented by the Contractor by maintaining a positive and continuous operation of the dewatering system. The Contractor shall be fully responsible and liable for all damages which may result from failure of this system.

7. Removal of dewatering equipment shall be accomplished after the system is no longer required; the material and equipment constituting the system, shall be removed by Contractor.

8. The Contractor shall take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects on the groundwater quality.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:

1. All fill material shall be subject to the approval of Owner.

2. All fill material shall be free of organic material, trash, or other objectionable material. Excess or unsuitable material shall be removed from the job site by Contractor.

B. Common Fill Material: Common fill shall be sand and shall not contain stones, rock, concrete to other rubble larger than two (2) inches in diameter. It shall have physical properties which allow it to be easily spread and compacted.

C. Structural Fill: Structural fill shall be reasonably well graded sand to gravelly sand having the following gradation:

U.S. Sieve Size	Percent Passing By Weight
1 - in	100
No. 4	75 - 100
No. 40	15 - 80
No. 100	0 - 30
No. 200	1 - 12

D. Class I Soils*: Manufactured angular, granular material, 1/4 to 1-1/2 inches (6 to 4 mm) size, including materials having significance such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells. Sieve analysis for crushed stone is given below separately.

Crushed Stone: Crushed stone shall consist of clean mineral aggregate free from clay, loam or organic matter, conforming with ASTM C33 stone size No. 89 and with particle size limits as follows:

U.S. Sieve Size	Percent Passing By Weight
1/2	100
3/8	90 - 100
No. 4	20 - 55
No. 8	5 - 30
No. 16	0 - 10
No. 50	0 - 5

E. Class II Soils**:

1. GW: Well-graded gravels and gravel-sand mixtures, little or no fines. Fifty (50) percent or more retained on No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

2. GP: Poorly graded gravels and gravel-sand mixtures, little or no fines. Fifty (50) percent or more retained on No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

3. SW: Well-graded sand and gravelly sands, little or no fines. More than fifty (50) percent passes No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

4. SP: Poorly graded sand and gravelly sands, little or no fines. More than fifty (50) percent passes No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

* Soils defined as Class I materials are not defined in ASTM D2487.
** In accordance with ASTM D2487, less than 5 percent pass No. 200 sieve.

F. Coarse Sand: Sand shall consist of clean mineral aggregate with particle size limits as follows:

U.S. Sieve Size	Percent Passing By Weight

No. 10	100
No. 20	0 - 30
No. 40	0 - 5

G. Other Material: All other materials, not specifically described, but required for proper completion of the work shall be selected by the Contractor and approved by Owner.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clearing:

1. The construction areas shall be cleared of all obstructions and vegetation including large roots and undergrowth, within 10 feet of the lines of the excavation.

2. Strip and stockpile topsoil on the site at the location to be determined by Owner.

3.02 EXCAVATION

A. Excavating for Roadways and Utilities:

1. Immediately document the location, elevation, size, material type and function of all new subsurface installations, and utilities encountered during the course of construction.

2. Excavation equipment operators and other concerned parties shall be familiar with subsurface obstructions as shown on the Drawings and should anticipate the encounter of unknown obstructions during the course of the work.

3. Encounters with subsurface obstructions shall be hand excavated.

4. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils. Subgrade soils which become soft, loose, "quick" or otherwise unsatisfactory for support of structures as a result of inadequate dewatering or other construction methods, shall be removed and replaced by crushed stone as required by Owner at the Contractor's expense.

5. The bottom of excavation shall be rendered firm and dry before placing any structure. Excavated material not suitable for backfill shall be removed from the site and disposed of by the Contractor.

6. All pavements shall be cut prior to removal, with saws or approved power tools.

7. Excavated material shall be stockpiled in such a manner as to prevent nuisance conditions. Surface drainage shall not be hindered.

8. All locations and elevations as required herein must be permanently documented

by the Contractor, on the Record Drawings prior to Owner's approval of the Application for Payment for that work.

9. When force main or sanitary sewer pipe crosses less than 10 feet from a water main, the depth of cover shall be increased to 5 feet or 18 inches below the water main, which ever is greater. When force mains or sanitary sewers are laid parallel to water main, the sanitary line is to be installed per Section 02730C.

3.03 DRAINAGE

A. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations, and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition. The dewatering method used shall prevent disturbance of earth below grade.

B. All water pumped or drained from the work shall be disposed of in a suitable manner with our undue interference with other work, without damage to surrounding property, and in accordance with pertinent rules and regulations.

C. No construction, including pipe laying, shall be allowed in water. No water shall be allowed to contact masonry or concrete with in 24 hours after being placed. The Contractor shall constantly guard against damage due to water and take full responsibility for all damage resulting from his failure to do so.

D. The Contractor will be required at this expense to excavate below grade and refill with approved fill material if the Owner determines that adequate drainage has not been provided.

3.04 UNDERCUT

A. If the bottom of any excavation is below that shown on the Drawings or specified because of Contractor error, convenience, or unsuitable subgrade due to the Contractor's excavation methods, he shall refill to normal grade with fill at his own cost. Fill material and compaction shall be as directed by Owner.

3.05 FILL AND COMPACTION

A. Compact and backfill excavations and construct embankment according to the following schedule. Backfill schedule for pipes is listed in Table 02200-A. (Standard shall be ASTM D-1557):

STRUCTURES AND ROADWORK

Area	Material	Compaction
Beneath Structures	Structural Fill	12" lifts, compacted to 95% maximum density. Fill should not be placed over any in place soils until those deposits have been compacted to 95% maximum density.
Around Structures	Structural Fill	8" lifts, 95% of maximum density. Use light rubber-tired or vibratory plate compactors.
From Cleared Existing Surface to Subgrade for Paved and Gravel Surfaces	Common Fill	12" lifts, 95% of maximum density.

B. Pipe shall be laid in open trenches unless otherwise indicated on the Drawings or elsewhere in the Contract Documents.

C. Excavations shall be backfilled to the original grade or as indicated on the Drawings. Deviation from this grade because of settling shall be corrected. Backfill operation shall be performed to comply with all rules and regulations and in such a manner that it does not create a nuisance or safety hazard.

D. Embankments shall be constructed true to lines, grades and cross sections shown on the plans or ordered by Owner. Embankments shall be placed in successive layers of not mare than 8 inches in thickness, loose measure, for the full width of the embankment. As far as practicable, traffic over the work during the construction phase shall be distributed so as to cover the maximum surface areas of each layer.

E. If the Contractor requests approval to backfill material utilizing lifts and/or methods other than those specified herein, such request shall be in writing to Owner. Approval will be considered only after Contractor has performed tests, at Contractor's expense, to identify the material used and density achieved throughout the backfill area utilizing the method of backfill requested. Owner's approval will be in writing.

END OF SECTION

SECTION 02232
LIMEROCK BASE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes furnishing, providing all labor, materials, equipment, transportation and performing all work necessary to construct a base course composed of limerock upon the prepared subgrade in accordance with these Specifications and with the lines, grades, notes and typical cross sections shown on the Drawings.

B. Related Sections: The following sections contain requirements that related to this section.

1. Section 02210 - Site Preparation and Earthwork

2. Section 02240 - Stabilized Subgrade

3. Section 02500 - Asphalt Concrete Pavement and Resurfacing

1.03 QUALITY ASSURANCE

A. Furnish complete laboratory analysis and obtain approval of the material by Owner prior to placement.

B. Construct the base course in accordance with the applicable provisions to the Florida Department of Transportation Standard Specifications For Road and Bridge Construction, (FDOT Specifications) latest edition and as specified herein.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Source: Miami Oolite Formation or Ocala Formation at the Contractor's option. Use only one formation on any project.

B. Composition: Limerock material showing no significant tendency to air slake or undergo any chemical change under exposure to weather and containing:

1. Not more than 0.5 percent of organic material or objectionable matter,

2. Not less than 70 percent of carbonates of calcium and magnesium,

3. Not more than 3 percent of water sensitive clay material.

C. Gradation: Graded uniformly down to dust with at least 97 percent (by weight) passing the 3 1/2-inch sieve and the fine material consisting entirely of dust of fracture.

D. Quality:

1. Uniform in quality and not containing cherty or other extremely hard pieces or lumps, balls or pockets of sand or clay size material in sufficient quantity as to prevent proper bonding, finishing or strength of the limerock base.

2. Nonplastic with liquid limit not exceeding 35.

3. Average LBR value not less than 100.

PART 3 - EXECUTION

3.01 GENERAL

A. Equipment: As necessary for the proper construction of the work, in first-class working condition, and as approved by Owner prior to its use.

B. Limits Of Construction: Construct the base to the full dimensions shown on the Drawings.

3.02 PERFORMANCE

A. Transporting limerock: Transport limerock to the point where it is to be used, over rock previously placed if practicable, and dump on the end of the preceding spread. No hauling over the subgrade or dumping on the subgrade will be permitted.

B. Spreading Limerock:

1. Spread limerock uniformly, and remove and replace all segregated areas of fine or coarse rock with well-graded rock.

2. When the specified compacted thickness of the base is greater than 6-inches, construct the base in two courses with the first course approximately one-half the total thickness of the finished base, but not less than the thickness required to bear the weight of the construction equipment without disturbing the subgrade.

C. Compacting And Finishing Base:

1. Single Course Base: After spreading is completed, scarify the entire surface and then shape to produce the required grade and cross section after compaction.

2. Double Course Base: After placing and compacting the first course, clean the

first course of foreign material, blade and bring to a surface cross section approximately parallel to that of the finished base. Prior to the spreading of any material for the upper course, conduct the density tests for the lower course and determine that the required compaction has been obtained. After the spreading of material for the second course is completed, finish and shape its surface so as to produce the required grade and cross section after compaction, free of scabs and laminations.

3. Moisture Content: When the material does not have the proper moisture content to insure the required density, wetting or drying will be required. If the material is deficient in moisture, add water and uniformly mix in by discing the base course to its full depth. If the material contains an excess of moisture, allow to dry until the required moisture content is attained before being compacted. In wetting or drying operations manipulate the entire width and depth of the base as a unit.

4. Density Requirements: As soon as proper conditions of moisture are attained, compact the material to a density of not less than 98 percent of the maximum density as determined by AASHTO T 180.

5. Density Tests:

   a. During final compacting operations, if blading of any areas is necessary to obtain the true grade and cross section, complete the compacting operations for such areas prior to making the density determinations on the finished base.

   b. Make at least three density determinations on each day's final operations on each course, and at more frequent intervals if deemed necessary by Owner.

6. Correction Of Defects:

   a. If at any time the subgrade material should become mixed with the base course material, dig out and remove the mixture, replace the materials removed with clean base material, and shape and compact the subgrade as specified above.

   b. If cracks or checks appear in the base, either before or after priming, which in the opinion of Owner would impair the structural efficiency of the base course, remove such cracks or checks by rescarifying, reshaping, adding base material where necessary and recompacting.

D. Testing Surface: Check the finished surface with a template cut to required crown and cross section and with a 10-foot straightedge laid parallel to the centerline of the road. Correct all irregularities greater than 1/4-inch by scarifying and by removing or adding limerock as may be required, and recompacting the entire area as specified herein before.

E. Thickness Determinations:

1. Measure the thickness of the compacted limerock base at intervals of not more than 100-feet at various points on the cross sections, prior to the application of

the prime coat.

2. Take the measurements in holes through the base of not less than 3-inches in diameter. Where the compacted base is deficient by more than 1/2-inch from the thickness called for on the Drawings, correct such areas by scarifying and adding limerock for a distance of 50-feet in each direction from the edge of the deficient area. Bring the affected areas to the required state of compaction and to the required thickness and cross section.

F. Priming and Maintaining:

1. Apply the prime coat only when the base is firm and unyielding, meets the specified density requirements and the moisture content in the top half of the base does not exceed 90 percent of the optimum moisture content of the base material.

2. Prior to applying the surface course, check that the crown and grade are true, with no rutting or other distortion, and that the base meets all the specified requirements.

END OF SECTION

SECTION 02234
SOIL CEMENT BASE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. The work specified in this Section consists of the construction of a base course composed of a combination of soil and Portland cement, uniformly mixed, moistened, compacted, finished, and cured, in accordance with these specifications, and shaped to reasonable close conformance with the lines, grades, thicknesses, and typical cross sections shown on the Drawings or established by Owner.

B. Related Sections: The following sections contain requirements that related to this section.

1. Section 02210 - Site Preparation and Earthwork

2. Section 02240 - Stabilized Subgrade

3. Section 02500 - Asphalt Concrete Pavement and Resurfacing

1.02 QUALITY ASSURANCE

A. Laboratory analysis shall be complete, and the material accepted by Owner prior to use.

B. The storage building, bin or silo for cement shall be weatherproof and shall be located convenient to the work to be performed.

C. Cement which has been damaged, which is partially set, or which is lumpy or caked, shall not be used, and the entire contents of the sack of cement or the container of bulk cement, which contains damaged, partially set, or lumps of caked cement, will be rejected for use. Cement salvages from discarded or used sacks shall not be used.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cement: The cement used in the work shall be domestic Portland cement that conforms to the requirements of AASHTO Designation M 85, Type I. The cement may be delivered in bags or in bulk.

B. Water:

1. Water for use with cement shall be clean and practically free of oil, acid, alkali, chlorides, organic matter, and other deleterious substances.

2. Water from city water supplies or other sources which are approved by a public health department may be accepted without being tested. Water from all other sources shall be tested and approved before use and shall impurities in excess of the following limits:

Acidity or alkalinity calculated in terms of calcium carbonate	0,05%
Total organic solids	0.05%
Total inorganic solids	0.08%
Total chlorides as sodium chloride	0.05%

C. Cut-Back Asphalt, Grade RC-70: Rapid-curing cut-back asphalt shall conform with the requirements of AASHTO Designation M 81 except that penetration range shall be from 60-120 instead of 80-120.

D. Emulsified Asphalt, Grade SS-1: Emulsified asphalt shall meet the requirements of AASHTO Designation M 140.

E. Soil: The soil for the base course shall consist of the natural material in the roadway or selected soil placed in the roadbed, as shown on the Drawings, or a combination of these materials, proportioned as directed. The soil shall not contain gravel or stone retained on a 2-inch sieve or more than 45% retained on a No. 4 sieve.

PART 3 - EXECUTION

3.01 GENERAL

A. Equipment: For performing the work specified in this Section the Contractor may use any machine, combination of machines, or equipment that are in good, safe working conditions and that will produce results meeting the requirements for cement application, soil pulverization, mixing water application, compaction, finishing and curing, as required herein. Special attention is direct to the necessity for utilizing compaction equipment which will produce the required density in a particular soil-cement blend.

B. Limits of Construction: The Contractor shall construct the base to the full width shown on the Drawings.

3.02 COMPOSITION AND PROPORTIONING

A. Cement: Portland cement shall be applied at the rate determined by Owner for a particular soil used; therefore, no processing of the soil-cement mixture shall be started until all tests of the soil to be used to construct the base have been completed and the specified rate of application of Portland cement for the particular soil has be determined. In general, a period of approximately three weeks, subsequent the time

that a particular section of the roadbed has been constructed substantially to grade, if required for such testing. The rate of application will be specified in terms of either pounds of Portland cement per square yards for the area to be mixed or pounds of cement per cubic yard of soil-cement mixture.

B. Water: The quantity of water required will be the amount necessary to comply with Article 3.04 below.

3.03 PREPARATION

A. Subgrade:

1. Before base construction operations are begun, the subgrade shall have been completed. The subgrade shall be firm enough to support the equipment used in the soil-cement base operations without appreciable distortion or displacement. Any unsuitable material shall have been removed and replaced with suitable material.

2. When the base is to be constructed of central plant-mix soil-cement, the subgrade shall be moist for a depth of at least one inch at the time the mixed base course material is placed thereon.

B. Base Soil: The area over which base is to be constructed shall be graded and shaped to an elevation which will provide a base in conformance with the grades, lines, thicknesses, and typical cross section shown on the Drawings. All roots, sticks, and other deleterious matter shall be removed during processing.

3.04 PERFORMANCE

A. Mixing:

1. General:

a. Mixing of the soil, cement and water shall be accomplished either by the mixed-in-place or the central plant-mix method.

b. The percentage of moisture in the soil at the time of cement application shall not exceed the quantity that will permit a uniform and intimate mixture of soil and cement during mixing operations. For clay soils it shall not exceed the optimum moisture content for the soil-cement mixture. For sandy soils the moisture content shall be within two percentage points above or below, the optimum moisture content. With certain type of soils, Owner may designate a moisture range other than those specified above.

c At completion of moist-mixing, the soil shall be so pulverized that 100 percent passes a one-inch sieve and a minimum of 80 percent passes a No. 4 sieve, exclusive of gravel and stone retained on the No, 4 sieve.

d. The operation specified in this subparagraph and in subparagraphs 3.4B

and C shall be continuous and shall be completed within a period of four hours starting from the time mixing commences.

2. Mix-In-Place

   a. Where feasible, the entire width of the base shall be processed as a single operation. The specified quantity of cement shall be spread uniformly on the soil at the required rate of application by means of an approved method. Spread cement that becomes displaced shall be replaced before mixing is started.

   b. After the cement has been applied, mixing shall begin within 60 minutes unless otherwise directed by Owner. The soil and cement shall be initially mixed until the cement has sufficiently blended with the soil to prevent formation of cement balls when additional water is applied; then water is added if necessary and the soil-cement mixture remixed.

   c. Processing may be to full depth in one course provided that satisfactory distribution of cement and water and the specified density can be obtained. If not, construction shall be in courses of such thickness that satisfactory results are obtained. Provisions shall be made to achieve adequate bonding between courses.

   d. Immediately after mixing of the soil and cement, any additional water that is necessary shall then be added. If the moisture content exceeds that specified, the soil-cement mixture shall be manipulated by remixing or blading, as required to reduce the moisture content to within the specified range. Excessive concentrations of water shall be avoided. During the time of application of water and after all mixing water has been applied, mixing shall continue until a uniform and intimate mixture of soil, cement and water has been obtained.

   e. At the option of the Contractor, as an alternative to the above described procedure he may use an approved machine that will blend the cement and the soil and then add and mix-in any additional water that is necessary.

3. Central Plant-Mix:

   a. The soil, cement and water shall be mixed in a pugmill, of either batch or continuous flow type. The plant shall be equipped with feeding and metering devices which will accurately proportion the soil, cement, and water in the quantities specified. Soil and cement shall be mixed sufficiently to prevent cement balls from forming when additional water is added. Mixing shall continue until a uniform and intimate mixture of soil, cement and water is obtained. The materials shall be mixed a minimum of 30 seconds.

   b. The mixture shall be hauled to the roadway in trucks equipped with protective covers. The mixture shall be placed on the moistened subgrade in a uniform layer by an approved spreader. Not more than 30 minutes shall elapse between the placement of soil-cement in adjacent

passes of the spreader at any location, except at longitudinal construction joints. The layer of soil-cement shall be uniform in thickness and surface contour, and in such quantity that the completed base will conform to the required grade and cross section. Dumping of mixture in piles or windrows upon the subgrade will not be permitted.

B. Compaction:

1. Compaction of the soil-cement mixture shall begin immediately after mixing is completed. In no case shall more than 60 minutes elapse between the last pass of moist-mixing and the start of compaction of the soil-cement mixture at a particular location.

2. At the start of the final compaction operation, the percentage of moisture in the mixture and in pulverized soil lumps, based on dry weights, shall not be more than two percentage points above or below the optimum moisture content.

3. The optimum moisture content and maximum density shall be determined in the field by the methods prescribed in AASHTO Designation T 134, on representative samples of the soil-cement mixture obtained from the area being processed.

4. The loose mixture shall be uniformly compacted to not less than 95 percent of the maximum density. During compaction operations, shaping may be required to obtain uniform compaction and required grade and cross section.

C. Finishing:

1. After compaction, the surface of the soil-cement shall be shaped to the required lines, grades, and cross section. In all cases where soil-cement mixture is added to any portion of the surfaces, the surface shall be lightly scarified with a spring tooth harrow, spike, drag, or other approved device, such that the surface is uniformly loosened prior to addition of material and prior to initial set of the soil-cement mixture. The resulting surface shall then be compacted to the specified density. Rolling shall continue until all rutting ceases and until the entire base conforms to the density requirements. With certain granular soils Owner may determine that minor tire marks are acceptable.

2. The moisture content of the surface material shall be maintained at not less than two percentage points below its specified optimum moisture content, during finishing operations. Surface compaction and finishing shall be done in such manner as to produce a smooth, dense surface, free of compacting planes, cracks, ridges, and loose materials.

3. If the time limits set forth herein are exceeded, the base shall be left undisturbed for a period of seven days, after which it will be examined by Owner to determine its suitability. If it is found suitable the Contractor shall be fully compensated providing the base meets all other requirements specified herein. If found unsuitable the base shall be removed and replaced by the Contractor without any additional compensation. The Contractor may, at his option, remove and replace the deficient base rather than wait the seven-day test cure.

D. Construction Joints: At the end of each day's construction a straight transverse construction joint shall be formed by cutting back into the completed work to form a true vertical face. The construction joint shall be located such as to exclude all of that part of the base at the end of the run which does not meet the requirements of the specifications and typical section.

E. Curing:

1. Surface Requirements: (Scalping and Hard planing): After compacting and finishing have been completed, and not later than the beginning of the next calendar day after the construction of any section of base, the surface shall be tested with a template cut to the required crown and with a 15-foot straightedge laid parallel to the center-line, and all irregularities greater than 1/4 inch shall be immediately corrected with a blade adjusted to the lightest cut which will ensure a surface that does not contain depressions greater than 1/4 inch under the template or straightedge. In the testing of the surface the measurements will not be taken in small holes caused by individual rocks having been pulled out by the blade. The material removed shall be wasted.

2. Protection Against Drying:

a. During the period when finishing and surface correction operations are being accomplished, the surface of the base shall be kept continuously moist by sprinkling as necessary. Subsequent to this period it shall be protected from drying for seven days, by application of either (1) cut-back asphalt, Grade RC-70, applied at a the rate of 0.15 to 0.20 gallon per square yard; or (2) a mixture containing equal parts of emulsified asphalt, Grade SS-1, and water, applied at the rate of 0.20 to 0.25 gallon of the diluted mixture per square yard. The actual rate of application shall be as directed and shall provide complete coverage without excessive runoff. At the time the bituminous material is applied, the soil-cement surface shall be dense and free of all loose and extraneous material, and shall contain sufficient moisture to prevent excessive penetration of the bituminous materials.

b. Should it be necessary to allow construction equipment or other traffic to use the completed base before the bituminous material has cured sufficiently to prevent pickup or displacement, the bituminous material shall be sanded, using approximately ten pounds of clean sand per square yard.

c. The curing material shall be maintained by the Contractor during the seven day protection period.

F. Opening to Traffic: No traffic shall be permitted on the base subsequent to completion of the finishing operations specified in paragraph 3.4C article H for a period of seven days. As an exception to this requirement the equipment necessary for correction of surface irregularities, application of water and application of curing materials will be allowed provided that the tire contact pressures of such equipment do not exceed 45 pounds per square inch. After the seven day curing period the base may be opened to traffic provided that it either is protected or has hardened sufficiently to prevent marring or distorting of the surface by equipment or traffic.

G. Maintenance: The Contractor shall maintain the base to a true and satisfactory surface until the wearing surface is constructed. Should any repairs or patching be necessary they shall extend to the full depth of the base and shall be made in a manner that will assure restoration of a uniform base course conforming to the requirements of these specifications. In no case shall repairs be made by adding a thin layer of soil-cement to the completed work. The Contractor may at his option, make full depth repairs to small or minor areas, such as at manholes, inlets, or the like, with Class C concrete.

H. Thickness;

1. During various stages of construction, test holes shall be dug in the mixture to determine the thickness. After the base is completed test holes shall be dug or drilled and the thickness of the base shall be determined from measurements made in these test holes.

2. Where the base is deficient in thickness by more than ½ inch, the area of deficient base shall be removed and replaced by base of the required thickness, at the Contractor's expense.

3. As an exception to the above, if the deficiency is considered to not be sufficient to seriously impair the required strength of the base, the deficient area may be left in place. No payment will be made for the base or the theoretical amount of cement used in areas left in place without correction.

END OF SECTION

SECTION 02240
STABILIZED SUBGRADE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes furnishing labor, equipment, materials and transportation necessary to construct stabilized subgrade for areas as shown on Drawings.

1. Contractor to stabilize parking areas to a minimum depth of 6-inches below the bottom grade of the base material and to a width of 6 inches outside each pavement or concrete curb edge.

2. Stabilize roadways and streets to 12 inches unless otherwise indicated on the Drawings. .

3. Where it fails to meet the specified Limerock Bearing Ratio (LBR) 40, stabilize the subgrade to the uniformity, density and bearing ratio specified as FDOT Type B.

B. Definitions: Use FDOT Type B stabilization as described in Florida Department of Transportation Standard Specifications For Road and Bridge Construction, (FDOT Specifications) latest edition and as specified herein to obtain the required bearing ratio by the addition and mixing in of suitable stabilizing material.

C. Related Sections: The following sections contain requirements that related to this section.

1. Section 02210 – Site Preparation and Earthwork

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Use either Commercial Materials or Local Materials as defined hereunder, at the Contractor's option.

B. Commercial Materials: Limerock, overburden or crushed shell meeting the following requirements:

1. Limerock and Limerock Overburden: Material with at least 70 percent of carbonates of calcium and magnesium, plasticity index not exceeding 10 and 97

percent of passing a 1 1/2-inch sieve.

2. Crushed Shell: Mollusk shell (i.e., oysters, mussels, clams, cemented coquina, etc.) meeting the following requirements.

   a. At least 97 percent by weight of the total material passing a 1-inch screen and at least 50 percent by weight of the total material retained on the No. 4 sieve.

   b. Not more than 7.5 percent by weight of the total material passing the No. 200 sieve as determined by washing the material over the sieve.

   c. In the event that the shell meets the above requirements without crushing, crushing will not be required. The use of steamed shell will not be permitted.

C. Local Material: High-bearing-value soils or sand-clay material with the portion passing the 40-mesh sieve having a liquid limit not greater than 30 and a plasticity index not greater than 10. Blending of materials to meet these requirements will not be permitted unless authorized by Owner. When permitted, test and obtain approval for the blended material before using.

D. Stabilization:

1. Determine bearing value by the Limerock Bearing Ratio (LBR) Method.

2. After grading operations are substantially complete, determine the quantity (if any) of selected stabilizing material to be added for compliance with the bearing value requirements.

3. Ensure that the finished subgrade meets the bearing value requirements, regardless of the quantity of stabilizing materials necessary to be added.

PART 3 - EXECUTION

3.01 PREPARATION

A. General:

1. Prior to the beginning of stabilizing operations, complete the subgrade to the lines, grades and cross section shown on Drawings.

2. Stabilize the subgrade in one course, unless the equipment and methods being used do not provide the required uniformity, particle size limitation, compaction and other desired results, in which case, perform the processing in more than one course as approved by Owner.

3.02 APPLICATION

A. Stabilizing Material: Spread the stabilizing material uniformly over the area to be

stabilized by means of mechanical material spreaders, except that where use of such equipment is not practicable other means of spreading may be used, but only upon written approval of Owner.

B. Mixing: By means of rotary tillers, or other equipment meeting the approval of Owner, thoroughly mix the subgrade throughout the entire depth and width of the area to be stabilized.

C. Maximum Particle size of Mixed Materials: At the completion of mixing, check that all particles of material within the limits of the area to be stabilized pass a 3 1/2-inch ring. Remove from the stabilized area any particles not meeting this requirement or break them down so as to meet this requirement.

D. Compaction: After the mixing operations have been completed and requirements for bearing value, uniformity and particle size have been satisfied, compact the stabilized area to a density of not less than 98% of maximum density as determined by AASHTO T 180. Compact the materials at a moisture content permitting the specified compaction. If the moisture content of the material is improper for attaining the specified density, either add water or allow drying until the proper moisture content for the specified compaction is reached.

E. Finish Grading: Grade and shape the completed stabilized subgrade to conform with the finished lines, grades and cross-section indicated in the Drawings.

F. Quality Assurance:

1. After the stabilizing and compaction operations have been completed, check that the subgrade is firm and substantially unyielding, to the extent that it will support construction equipment and will have the bearing value required.

2. Remove and replace with suitable material all soft and yielding material, and any other portions of the sub-grade which will not compact readily, and bring the whole subgrade to line and grade, with proper allowance for subsequent compaction.

G. Maintenance Of Completed Subgrade: upon completion, maintain the subgrade free from ruts, depressions and any damage resulting from the hauling or handling of materials, equipment, tools, etc. Maintain the required density until the subsequent base or pavement is in place. Make any repairs, replacement of curb and gutter, sidewalk, etc., which might become necessary in order to re-compact the subgrade in the event of under-wash or other damage. Construct and maintain ditches and drains as necessary to protect the completed subgrade from damage by storm water.

3.03 FIELD QUALITY CONTROL

A. Bearing Value Requirements:

1. General: Bearing value samples will be obtained and tested by Owner at completion of satisfactory mixing of the stabilized area. For any area where the bearing value obtained is deficient from the value indicated in the Drawings, in excess of the tolerances established herein, spread and mix in additional stabilizing material as specified above for the full width of the roadway being stabilized and longitudinally for a distance of 50-feet beyond the limits of the area in which the bearing value is deficient. Pay for all retesting required until subgrade meets the specified requirements.

2. Tolerances In Bearing Value Requirements: A under tolerance of 5.0 from the specified bearing value of LBR 40 will be allowed as based on tests performed on samples obtained after mixing operations have been completed.

END OF SECTION

SECTION 02500
ASPHALT CONCRETE PAVING AND RESURFACING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

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

1.02 SUMMARY

A. This Section includes furnishing labor, equipment, materials and transportation for the installation of asphalt concrete paving to the extent as shown on Drawings.

B. Related Sections: The following sections contain requirements that related to this section.

1. Section 02232 – Limerock Base

2. Section 02234 – Soil Cement Base .

1.03 SUBMITTALS:

A. Material Certificates: Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

1.04 QUALITY ASSURANCE

A. Codes and Standards: Comply with State Department of Transportation Standard Specifications, latest edition, and with local governing regulations if more stringent than herein specified.

1.05 SITE CONDITIONS

A. Weather Limitations: Apply prime and tack coats when ambient temperature is above 50 deg. F (10 deg. C), and when temperature has not been below 35 deg. F (1 deg. C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

B. Construct asphalt concrete surface course when atmospheric temperature is above 40 deg. F (4 deg. C), and when base is dry. Base course may be placed when air temperature is above 30 deg. F (-1 deg. C) and rising.

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

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Use locally available materials and gradations which exhibit a satisfactory record of previous installations.

B. Base Course Aggregate: Limerock or cemented coquina shell meeting Florida Department of Transportation Specification Sections 911 or 915, respectively. See Soils Report.

C. Surface Course Aggregate: Crushed stone, crushed gravel, crushed slag, and sharp-edged natural sand.

D. Sand prepared from stone, blast-furnace slag, or gravel, or combinations thereof may be used if required to suit local material availability.

E. Asphalt Concrete: Shall comply with Florida Department of Transportation Specifications, Section 331, Type S-1 for parking areas. See Soils Report.

F. Prime Coat: Shall comply with Florida Department of Transportation Standard Specifications, Section 300.

G. Herbicide Treatment: Commercial chemical for weed control, registered by Environmental Protection Agency. Provide granular, liquid, or wettable powder form.

H. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

Allied Chemical Corp.
Achem Products, Inc.
Ciba-Geigy Corp.
Dow Chemical U.S.A.
E.I. DuPont De Nemours & Co., Inc.
FMC Corp.
Thompson-Hayward Chemical Co.
U.S. Borax and Chemical Corp.

I. Lane Marking Paint: Chlorinated rubber-alkyd type, AASHTO M 248 (FS TT-P-115), Type III.

J. Wheel Stops: Precast of 3,500 psi air-entrained concrete, approximately 6" high, 9" wide, and 7'0" long, with chamfered corners and drainage slots on underside.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION:

A. Remove loose material from compacted subbase surface immediately before applying herbicide treatment or prime coat.

B. Proof roll prepared subbase surface to check for unstable areas and areas requiring additional compaction.

C. Notify Owner of unsatisfactory conditions. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving.

D. Herbicide Treatment: Apply chemical weed control agent in strict compliance with manufacturer's recommended dosages and application instructions. Apply to compacted, dry subbase prior to application of prime coat.

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

F. Tack Coat: Apply to contact surfaces of previous constructed asphalt or Portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at rate of 0.05 to 0.15 gal. per sq. yd. of surface. Allow to dry until at proper condition to receive paving.

G. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Remove and clean damaged surfaces.

3.02 PLACING MIX

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

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

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

3.03 ROLLING

A. General: Begin rolling when mixture will bear roller weight without excessive displacement.

B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

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

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

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

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

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.04 TRAFFIC AND LANES MARKINGS

A. Cleaning: Sweep and clean surface to eliminate loose material and dust.

B. Striping: Use chlorinated-rubber base traffic lane-marking paint, factory-mixed, quick-drying, and non-bleeding. Apply paint with mechanical equipment to produce uniform straight edges. Apply in 2 coats at manufacturer's recommend rates.

C. Color: Yellow.

D. Do not apply traffic and lane marking paint until layout and placement has been verified with Owner.

3.05 WHEEL STOPS

A. Secure wheel stops to asphalt concrete surface with not less than two 3/4" diameter galvanized steel dowels embedded in precast concrete at 1/3 points. Size length of dowel to penetrate at least 6" into asphalt concrete. Drill placement holes oversize and embed dowels in hot bituminous grout material.

3.06 FIELD QUALITY CONTROL

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

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

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

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

1. Wearing Course Surface: 1/8".

2. Check surface areas at intervals as directed by Owner.

END OF SECTION

SECTION 02650
WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes furnishing labor, equipment, materials and transportation necessary for the installation of a complete system of water distribution, consisting of pressure piping, valves and appurtenant items as shown on Drawings and specified herein.

B. Related Sections: The following sections contain requirements that related to this section.

1. Section 02220 - Excavating, Backfilling, and Compacting

2. Section 15420 – Disinfection of Water Lines

3. Section 15425 – Hydrostatic Testing of Pressure Pipelines

4. Division 3 – Concrete

1.03 QUALITY ASSURANCE

A. Design Requirements:

1. Install all water mains with a minimum cover of 36 inches below finished grade unless otherwise indicated.

2. Construct water mains of the materials indicated on the Drawings, unless otherwise directed by Owner.

3. When using PVC, provide only pipe and fittings bearing the approval seal of the National Sanitation Foundation (NSF) for potable water pipe.

4. For changes in horizontal alignment of 45 degrees or less, pipe deflection, not exceeding limits set forth in applicable AWWA Standards, may be used in lieu of fittings, subject to approval of Owner.

5. Install all valves with a minimum cover of 12 inches below finished grade, and valve boxes flushed with finished grade unless otherwise indicated.

6. Install valves and valve boxes of the type, size and model indicated on the

Drawings, unless otherwise directed by Owner.

7. Provide restrained joints conforming to the details shown on the drawings for all valves.

B. Pipe Inspection: Obtain from the pipe manufacturer a certificate of inspection to the effect that the pipe and fittings supplied for this Contract have been inspected at the plant and that they meet the requirements of these specifications. Visually inspect all pipe and fittings at time of delivery and just before they are placed in the trench, and reject and remove joints or fittings that do not conform to these specifications.

C. Prevention of Electrolysis: Prevent the contact of dissimilar metals by means of an insulating or dielectric coupling.

1.04 SUBMITTALS

A. Submit shop drawing, product data, certifications, etc., in accordance with general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections..

B. Submit shop drawings for the following items prior to construction:

1. Mill test certificates or certified test reports on pipe

2. Details of restrained and flexible joints

3. Meter vaults and boxes

4. Valves and valve boxes

5. Backflow preventer assemblies

6. Service connection assemblies

7. Joint lubricant

8. Pipe laying schedule

9. Temporary plug and anchorage system for hydrostatic pressure test

10. Transition joints where required

1.05 JOB CONDITIONS

A. Water in Excavation: Unless otherwise approved by Owner, water will not be allowed in the trenches while the pipes are being laid and/or tested. Excavated not more trench than the available pumping facilities are able to dewater. Dispose of all water so as not to injure or interfere with the normal drainage of the territory in which he is working. Do not use pipelines being installed as drains for such water, and properly and adequately block the ends of the pipe during construction by means of approved

stoppers. Prevent the entrance of mud, sand, or other obstructing matter into the pipelines. If on completion of the work any such material has entered the pipelines, flush out the entire system until clean and unobstructed.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE AND FITTINGS

A. Pipe: Ductile iron pipe conforming to the requirements of AWWA C151, Class 54 for 4-inch lines, Class 53 for 6-inch, Class 52 for 8-inch and Class 50 for all larger sizes, unless otherwise specified. Use Class 53 minimum for all pipes having threaded flange or grooved end joints. Provide pipe interior with a bituminous seal coat over a cement mortar lining conforming to AWWA C104, and exterior of pipe with the manufacturer's standard bituminous coating applied by the airless spray method.

B. Fittings: Ductile iron fittings with a minimum pressure rating of 350 psi, conforming to the requirements of AWWA C 110, cement lined, seal coated and outside coated as specified above for ductile iron pipe. Use fittings with mechanical joints for underground use and grooved or flanged joints for above ground use.

C. Joints:

1. Mechanical joints: Joints conforming to AWWA C 111, with bolts and nuts machined true and nuts tapped at right angle to a smooth bearing surface. Use bolts of high strength, annealed cast iron, or high strength low alloy steel, T-head type having hexagonal nuts.

2. Push on Joints: Single seal gasket push on type joints conforming to the requirements of AWWA C 111 and equal to Tyton, Fastite, Super Bell Tite, Altite.

3. Restrained Joints: Types fabricated by the various manufacturers, and approved by Owner. Joints using set screws or that require field welding will not be acceptable. Restrain all underground pressure pipes. Factory restrained joints shall be used. Mechanical joints with megalugs by EBAA Iron Works, Field-flex or fast-grip by American Ductile Iron or equal by U.S. Pipe shall be allowed on approval by Owner on a case by case basis where the pipe must be cut in the field.

4. Thrust Blocks: To be approved by Owner.

5. Gaskets: Vulcanized crude rubber or polyvinyl chloride plastisol with plain tips unless otherwise specified.

2.02 POLYVINYL CHLORIDE PIPE AND FITTINGS:

A. Pipe:

1. 4 Inches and Larger: PVC pipe conforming to AWWA C900 with Cast-Iron-Pipe Equivalent Outside Diameters and minimum Dimension Ratios (DR) of 18 for

pipe sizes through 12 inches diameter and AWWA C905 with minimum Dimension Ration of 26 for pipes larger than 12 inches.

2. Smaller than 4 Inches: PVC pipe conforming to ASTM D 1785, Class 1120 or 1220, Schedule 80 for pipe 2 inches and smaller and Schedule 40 for pipe larger than 2 inches. Use only Schedule 80 for all threaded pipe.

B. Fittings:

1. 4 Inches and Larger: Fittings furnished by the manufacturer of the pipe with which they are used, with elastomeric joints conforming to ASTM D 3139 or ductile iron fittings as previously specified for use with ductile iron pipe.

2. Smaller than 2 Inches: Schedule 80 PVC with solvent weld or threaded joints and conforming to ASTM D 2467 and D 2464 respectively.

C. Joints:

1. 4 Inches and Larger: Elastomeric gasket joints conforming to ASTM D 3139 suitable for the pressure rating of the pipe. The joint may be a coupling manufactured as an integral part of the pipe barrel consisting of a thickened section with an expanded bell with a groove to retain a rubber sealing ring of uniform cross section, similar and equal to Johns-Manville Ring-Tite and Davis Meter Dav-Tite, or may be made with a separate twin gasketed coupling similar and equal to Certainteed Fluid-Tite.

2. Smaller than 4 Inches: Solvent welded in accordance with the recommendations of the pipe manufacturer, using the solvent welding compound furnished with the pipe, or threaded. Use threaded joints only with Schedule 80 pipe or better. At threaded joints between PVC and metal pipe, the metal shall contain the socket ends and PVC spigots. Do not under any circumstance, screw a metal spigot into a PVC socket.

2.03 GATE VALVES

A. Less than 3 inches: Bronze, single wedge, non-rising stem, screwed bonnet, 125 pound S.P., 200 pound W.O.G. with stuffing box repackable under pressure and all parts renewable and conforming to Federal Specifications WW-V-54 for Class A, Type I. Provide ends as shown on the Drawings.

B. 3 inches and Larger: Iron body, non-rising stem, bronze mounted gates valves, with mechanical joints and/or single gasket push-on type, conforming to AWWA C500 and having a 2-inch square operating nut and O-ring seals replaceable while in service without undue leakage.

C. 16 inches and Larger: Valves conforming to AWWA C500 but when installed horizontally, have bevel gearing, a gear case that can be repacked from the outside, rollers, and scrapers constructed so that the weight of the gate is carried on the rollers throughout the entire length of travel.

2.04 BUTTERFLY VALVES

A. General: Tight-closing valves with rubber seats securely fastened to the valve body or disc, with 90 degrees disc rotating from full open position to tight shut position, bubble-tight at rated pressures with flow in either direction, and satisfactory for applications involving frequent operation and for applications involving valve operation after long periods of inactivity and for buried installation. No metal-to-metal seating surfaces will be permitted. Provide valves conforming to AWWA C504 for Class 150B, as manufactured by Henry Platt Company, Allis-Chamber, Dresser or equal.

B. Valve Body: Cast iron ASTM a 126 Class B, with mechanical joint ends, two trunnions for shaft bearings integral with valve body, and, when the disc has the rubber seat, a 18-8 Type 304 stainless steel body seat.

C. Valve Discs: Either alloy of cast iron ASTM A 436 Type 1 (Ni-Resist), ductile iron ASTM A 536, or cast iron ASTM A 48, each with type 316 stainless steel seating edge, or the entire disc may be constructed of cast 316 stainless steel. The stainless steel seating edge is not applicable to rubber seat disc type valves.

D. Valve Seats: Synthetic or natural rubber compound, mounted on either the disc or valve body.

E. Valve Bearings: Sleeve-type bearings, corrosion resistant and self-lubricating.

F. Buried Locators: Permanently lubricated, sealed for submersion in water for pressures of 20 feet, with a two inch square AWWA operating nut indicating the direction to open, and constructed such that the valve will open when the nut is turned to the left (counterclockwise) to open.

2.05 CHECK VALVES

A. Smaller than 4 inches: Bronze, bronze disc, swing check valves conforming to Federal Specification WW-V-51D, Type 4 Class a-125 pound, with ends as shown on the drawings.

B. 4 inches and Larger: Swing check valves having a cast iron or cast steel body, with bronze or stainless steel seat ring, non-corrosive shaft for attachment of weight on lever, a 300 psi hydrostatic test pressure rating and designed to absolutely prevent the return of water back through the valve when the inlet pressure decreases below the delivery pressure. Provide full opening, tight seating valve with renewable seat ring securely held in place by a threaded joint, and valve disc of cast iron or cast steel suspended from a non corrosive shaft passing through a stuffing box.

2.06 DETECTOR CHECK VALVE

A. Double check detector, UL and FM approved, with meter bypass and integral backflow preventer, OS&Y gate valve equal to Watts Model DDC.

2.07 SOLENOID VALVES

A. Solenoid valves on the plant water line shall be normally closed. All solenoid valves shall include a manual override operator (MO). Valves shall be of brass body construction, resilient seating, general purpose service Red-hat Type as manufactured by Automatic Switch Co. (ASCO), Florham Park, N.J., or equal.

2.08 AIR RELEASE VALVES

A. Manual Type: Galvanized steel pipe conforming to ASTM A 53, Schedule 40, with gate valves conforming to Federal Specification WW-V-54D, Type I, Class A, wedge disc, non-rising stem, 125 psi steam pressure rating, assembled as shown on the Drawings.

B. Automatic Type: Air release valves designed and manufactured for water service, that will not stick or leak water under continued long operating conditions, that will open under high internal pressure, and incorporating a solids settling chamber or trap and a flushing system by which the trap and the entire valve can be back flushed and cleaned, as manufactured by APCO, Val Matic or equal.

2.09 VALVE BOXES:

A. Cast iron valve boxes, of 3-piece construction, adjustable to fit the designated depth of earth cover over the valve, designed so as to prevent the transmission of surface loads directly to the valve or piping, having an interior diameter of not less than 5 inches, and with covers marked "WATER" so constructed as to prevent tipping or rattling. Provide valve boxes with covers equal to Clow Corporation No. F-2450, or Mueller Company No. H-10357. Provide cast iron extension sections, 6-inch in diameter over hydrant valves and 10-inch diameter over all other valves, and protective rings of Class B (3000 psi) concrete.

2.10 VALVE VAULTS:

A. Precast concrete of the type shown on the Drawings and conforming to the applicable requirements of Division 3, with cover for the non-traffic bearing vault constructed of 3/16-inch steel floor plate with reinforcement, galvanized after fabrication by the hot dip method in conformance with ASTM A 123.

2.11 TAPPING SLEEVES AND VALVES

A. Split cast iron tapping sleeves rated for 150 psi working pressure and non-rising stem gate valves with O-ring seals and conforming to applicable requirements for gate valves as specified above. Steel tapping sleeves will not be acceptable.

2.12 CORPORATION STOPS

A. Mueller Co. Type H-15000 for 1 inch service and type H-10003 for 2-inch service or equal.

B. Ford Meter Box Co. Type F-100, Mueller Co. Type H-15009 or equal, with inlet having AWWA tapered threads and outlet for polyethylene or copper tubing with stainless steel insert stiffener.

2.13 SERVICE TERMINAL FITTINGS

A. Single 1 inch Terminal Fitting: 1 inch ring style valve, drilled for wire sealing, angle inverted key meter valve cat. No. KV-23W by Ford Meter Box Co. No. UV63-42W, Hays No. 25040 DF or equal.

B. Twin 1 Inch Terminal Fitting: 1 inch branch valve assembly, with standard 7 1/2-inch spacing between outlet centers, drilled for wire sealing, Ford Meter Box Co. No. UV63-42W, Hays NO. 25040 DF or equal.

2.14 HOSE BIBB AND BACKFLOW PREVENTER

A. Hose Bibb: 3/4-inch cast bronze sediment faucet with wheel handle, stem and seat seals of Buna-N or TFE rubber, equal to Mueller Co. No. H-8260 or Chicago Faucet Co. No. 993, or approved equal. Potable water bibb shall be No. 952, 3/4 inch or 1-inch with vacuum breaker as noted on the drawings

B. Backflow Preventer: Watts Regulator Co. No. 8A 3/4-inch atmosphere type backflow preventer, or approved equal.

2.15 PLANT WATER SERVICE METER

A. Provide a bronze 1-1/2-inch magnetic drive rotating disc meter by Rockwell International or approved equal.

B. The meter shall be provided with high speed pickup register with local flow indicator and totalizer. The meter shall meet all requirements of AWWA C700, including the accuracy requirements.

2.16 METER BOXES

A. Precast concrete of the style shown on the drawings and as manufactured by Brooks Products of Florida, Inc., Cast Crete Corporation or equal, with steel cover and lid fabricated from steel tread plate and hot dipped galvanized after fabrication in accordance with ASTM A 123.

2.17 ANCHORAGES

A. For PVC Mains: Full circle bearing type. Clamps, Straps, and Washers in accordance with ASTM A 506, steel.

B. Rods and Bolts:

1. Steel for rods conforming to the requirements of ASTM A 242, steel.

2. Rods galvanized in conformance with ASTM A 123.

3. Rod couplings in accordance with ASTM A 197, malleable iron.

4. Bolts: ASTM A 307, steel.

5. Cast-Iron Washers: ASTM A 126, gray iron.

6. For tie rods and tie bolts, use Super Star Tierod (Fig. No. SS12) and Tiebolt (Fig. No. SST7) as manufactured by Star National Products or equal. .

2.18 CONCRETE

A. As specified in Division 3.

2.19 ADDITIONAL WORK:

A. Conform to specific details shown on the Drawings, and provide construction of first-class materials conforming to the applicable portions of these Specifications.

PART 3 - EXECUTION

3.01 PREPARATION

A. Pipe Cradle: Upon satisfactory installation of the pipe bedding material as specified in Section 02220 - Excavating, Backfilling and Compacting, dig by hand a continuous trough for the pipe barrel and recesses for the pipe bells or couplings to insure continuous, uniform support for the pipe and barrel and that no pressure will be exerted on the pipe joints from the trench bottom.

B. Cleanliness: Thoroughly clean the interior of the pipes of all foreign matter before

placing them in the trench and keep them clean during laying operations by means of plugs or other methods. During suspension of work for any reason at any time, place a suitable stopper in the end of the pipe last laid to prevent mud or other foreign material from entering the pipe.

3.02 INSTALLATION

A. Pipe:

1. Gradient: Install straight, and maintain depth of cover uniform with respect to finish grade, whether grading is completed or proposed at time of pipe installation. Where a grade or slope is shown on the Drawings, use batter boards with string line paralleling the design grade, or other previously approved means, to assure conformance to required grade.

2. Pipe Joint Deflection: Use pipe deflection only within the maximum limits allowed in AWWA C600 for ductile iron pipe and the maximum limits as established by the manufacturer of PVC pipe.

3. Rejects: Immediately remove defective pipe and replace with sound pipe at no cost to the Owner.

4. Anchors: Place concrete thrust blocks conforming to the details shown on the Drawings at all bends, tees, plugs and other fittings to provide lateral support, except when restrained joints are specified.

5. Joint Compounds: Use no sulfur base joint compound.

B. Ductile Iron Pipe Joints:

1. Type: Make the joints of all pipelines absolutely tight, using joints approved by the Owner prior to installation. Where shown on the Drawings or where, in the opinion of the Owner, settlement or vibration is likely to occur, use bolted joints.

2. Mechanical Joints: Install mechanical joints in full conformance with manufacturer's recommendations, using only especially skilled workmen. Use torque wrenches set specified in AWWA C111, or spanner type wrenches not longer than specified therein.

3. Push On Joints: Install push on joints in strict, complete compliance with the manufacturer's recommendations, using lubricant, if required, shall be an inert, nontoxic, water soluble compound incapable of harboring, supporting, or culturing bacterial life.

4. Restrained Joints: Provide restrained joints at changes in direction of all ductile iron pipe water mains. Tees and dead ends valved or capped are considered equivalent of 90 degrees bends. Test pressure is recommended at 200 psi.

5. Thrust Blocks: Install thrust blocks as approved by Owner.

C. Polyvinyl Chloride Pipe Joints: Assemble the joints absolutely tight and in conformity

with the requirements of the pipe manufacturer. For threaded joints, wrap the male threaded end with Teflon pipe tape. At threaded joints between PVC and metal pipes, always use a metal socket end and PVC spigot. Do not, under any circumstances, screw a metal spigot into a PVC socket. Restrain all underground pressure pipe.

D. Installing Valves and Boxes:

1. Valves: Carefully inspect, open wide and then tightly close the valves and test the various nuts and bolts for tightness. Take special care to prevent any foreign matter from becoming lodged in the valve seat. Unless shown otherwise, set valves with their stems vertically above the center line of the pipe. Remove and replace any valve that does not operate correctly.

2. Valves Boxes: Carefully center valve boxes over the operating nuts of the valves so as to permit a valve key to be fitted easily to the operating nut. In areas to be paved, set valve boxes to conform to the level of the finished surface and hold in position by a ring of concrete placed under the support flange as shown on the Drawings. Set the valve box so that surface loads are not transmitted to the pipe or valve. Reset any valve box which is out of alignment or whose top does not conform to the finished ground surface. Before final acceptance of the work, adjust all valve boxes to finish grade.

E. Concrete Encasement:

1. Provide concrete encasement of Class C (2500 psi) concrete in accordance with details shown on the Drawings where indicated or ordered by the Owner.

2. Commence and end pipe encasement at not more than 6-inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads. Use Class C (2500 psi) concrete.

F. Backfilling:

1. After pipe has been laid, inspected, and found satisfactory, place sufficient backfill along the pipe barrel to hold the pipe securely in place during hydrostatic testing. Place no backfill over joints until the testing is satisfactorily completed, leaving them exposed to view for the detection of visible leaks.

2. Upon satisfactory completion of the hydrostatic test, complete backfilling of the trench.

G. Concrete Protective Slabs: Where waterways, canals, ditches or other cuts are crossed, install protective concrete slabs across and to 10 feet each side of the bottom. Place approved utility crossing signs on the pipe alignment at each side of the canal, waterway, etc.

3.03 INSTALLATION OF ANCHORAGES

A. Anchorages: Provide anchorages for tees, plugs and caps, bends, crosses, valves, and hydrants branches.

3.04 APPLICATION OF PROTECTIVE COATINGS

A Apply full coat of asphalt or other acceptable corrosion-retarding material to surface of installed ferrous anchorage devices.

3.05 FIELD QUALITY CONTROL

A. Flushing: Flush the water mains with water to remove all sand and other foreign matter, and dispose of the flushing water without causing a nuisance or property damage.

B. Hydrostatic Tests in accordance with Section 15415.

C. Disinfection of Potable Water Lines in accordance with Section 15410.

3.06 CONNECTION TO EXISTING SYSTEM

A. Make all the connections to existing system mains under the direction of the owners of the existing system. Valves separating the mains being installed from existing mains will be operated by or under the directions of said owner's representative. Special disinfecting procedures shall be used in connection to existing mains and where the method outlined in Section 15410 is not practical.

B. In the event the proposed main is to be connected to a main in which has one or more active services between the point of connection and the first existing line valve, install a temporary plug or cap on the new main until the pressure tests are complete.

C. In the event any existing users will be without water while a connection is being made, notify them when the water will be turned off and the estimated time service will be resumed.

END OF SECTION

SECTION 02710
CONCRETE SIDEWALK

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section included furnishing all labor, material, equipment, transportation and performing all work necessary for the construction of the sidewalks to the lines and grades as shown on Drawings.

B. Related Sections: The following sections contain requirements that related to this section.

1. Section 02210 – Site Preparation and Earthwork

2. Section 03100 - Concrete Formwork

3. Section 03200 - Concrete Reinforcement

1.03 SUBMITTALS

A. Submit, in accordance with general conditions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, certificates by the producers or manufacturers that the furnished materials meet the specific requirements of the Specifications.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete: Class B (3000 psi) conforming to the requirements of Section 03300.

B. Welded Wire Fabric: As specified in Section 03200.

C. Preformed Joint Filler: Non-extruding and resilient bituminous type conforming to the requirements of ASTM D 1751.

D. Membrane Curing Compound: Clear fugitive dye conforming to the requirements of AASHTO M 148. Type l-D, Class A.

PART 3 - EXECUTION

3.01 PREPARATION

A. Subgrade Condition:

B. Maintain the finished subgrade in a smooth, compact condition and restore any areas which are disturbed prior to placing of the concrete. Uniformly apply water ahead of the pouring operalions as directed by the Engineer to keep the subgrade moist at the time the concrete is placed. Remove large boulders and other obstructions to a minimum depth of 6 inches below the finished subgrade elevation, and backfill the space with sand, base course matenal or other suitable material thoroughly compacted by rolling or tamping.

C. Trim the subgrade accurately to the required elevation with a ¼- inch tolerance. Trim high areas to proper elevalion. Fill low areas with suitable material and compact to the specified density, or fill with concrete integrally with the placing of the pavement.

D. Setting Forms: Set the forms accurately to line and grade and so that they rest firmly throughout their length, upon the compacted subgrade surface. Join forms neatly and tightly and brace them to resist the pressure of the concrete and the finished operations. Obtain the Engineer's approval for the alignment and grade of all forms before and immedialely prior to the placing of concrete.

E. Slipforming: The slipforming method will be allowed, provided that an acceptable finished product, true to line, grade, and cross section is consistently produced.

F. Mixing Concrete: Mix in accordance with the requirements of Section 03300.

3.02 INSTALLATION

A. Placing Concrete:

1. Distribute the concrete on the subgrade to such depth that when it is consolidaled and finished, the thickness required by the Civil Engineering Drawings will be obtained at all points and the surface will at no point be below the grade specified for the finished surface. Deposit the concrete on the subgrade in a manner which will require as little rehandling as possible and is continuous between transverse joints, without the use of intermediate bulkheads.

2. Final Finish: As soon as the water sheen has disappeared and just before the concrete becomes non-plastic, finish all edges, including expansion joint edges, with an edging tool having a radius of ½-inch. Finally give the top a light broom finish perpendicular to the forms.

B. Joints:

1. Transverse Construction Joints: Construct at the end of all pours and at other locations where the pouring operating are stopped for as long as 30 minutes, but not within five feet of any other transverse joint or of either end of a section of walk. If sufficient concrete has not been placed to form a slab at least five feet

long, remove the excess concrete, back to the last preceding joint. Form the joints by placing a wood or metal bulkhead accurately and securely in place, in a plane perpendicular to the profile and center line of the walk. Tool edges of constructlon joints with a ½ -inch radius.

2. Transverse Construction Joints: Form at five foot intervals as planes of weakness created by an edging tool. Cut the fresh concrete perpendicular to the surface of the walk, to a depth of 1-1/2 inches below the top surface and tool edges to ½ -inch radius.

3. Transverse Expansion Joints: Form by placing preformed joint filler, one-half inch thick around all structures and at intervals not exceeding 100 feet.

C. Curing:

1. After the finishing operations have been completed and as soon as the concrete has hardened sufficiently that marring of the surface will not occur, cover the entire surface and the edges of the newly placed concrete and cure with membrane curing compound.

2. Apply curing compound uniformly to the surfaces to be cured, in a continuous film, at the rate of application and in the manner recommended by the manufacturer.

3. Do not apply the curing compound during periods of rainfall. Should the film become damaged from any cause within the required curing period, immediately repair the damaged portions with additional compound. Upon removal of side forms immediately coat the sides of the slabs exposed, providing a curing treatment equal to that provided for the surface.

D. Form Removal: After the concrete has sufficiently set a minimum of 12 hours, remove the forms and backfill the space on each side. Compact and grade the earth in a satisfactory manner without damage to the concrete work. Fill honeycombs with sand cement mortar. Plastering will not be allowed on the face of the walk. Remove rejected walk and replace without additional compensation.

END OF SECTION

SECTION 02720
STORM DRAINAGE SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMAMRY

A. This Section included furnishing all labor, material, equipment, transportation and performing all work necessary for the construction of the storm drainage system consisting of culverts, storm sewers, inlets and other drainage structures as shown on Drawings and specified herein.

B. Related Sections: The following sections contain requirements that related to this section.

1. Section 02221- Excavating, Backfilling and Compacting
2. Section 03410 - Precast Concrete Structures
3. Section 02210 - Site Preparation and Earthwork

1.03 SUBMITTALS

A. Submit shop drawings, product data, certifications, etc., in accordance with General and Supplementary Conditions and Division 1 Specifications Sections.

B. Submit shop drawings for the following items:

1. Grates and castings
2. Precast structures

C. Submit product data and certification of quality by producers prior to installation.

1.04 JOB CONDITIONS

A. Existing Drainage System: Maintain operational, prevent siltation and flooding.

B. Cleanup: Maintain surface grade within 400 feet of pipe laying operation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete Pipe: Reinforced concrete culvert pipe conforming to ASTM C 76, Class III, unless otherwise indicted and reinforced concrete horizontal elliptical pipe conforming to ASTM C 507, Class HE III, with rubber gasket joints conforming to Sections 941 and 942 of FDOT Specifications.

B. Brick: Dense, hard burned, shale or clay brick conforming to ASTM C 32, Grade MM or C 62, Grade MW, except with brick absorption between five and twenty-five grams of water absorbed in one minute by dried brick, set flat face down, in 1/8-inch of water.

C. Cement Mortar: One part and two parts clean sharp sand with lime added in an amount not exceeding twenty-five percent of volume of cement. Mix dry and then wet to proper consistency for use. Use no mortars that have stood for more than one hour.

D. Concrete: Class B (3000 psi) concrete conforming to Section 03300 unless otherwise indicated on Drawings.

E. Precast Concrete Units: Units constructed in accordance with Section 03410 using Class (4000 psi) concrete.

F. Ballast Rock: Locally procured ballast rock obtained from fresh water sources, washed free of deleterious matter, having not more than 45 percent loss of section as specified by AASHTO M63 governing the Los Angeles Abrasion Test, Showing not more than a 10 percent loss in 10 cycles as specified by AASHTO M 63 governing the soundness test, and meeting gradation requirements as specified by AASHTO M 43 for size number 24 (2-1/2 to 3/4 inch) or number 4 (1-1/2 to 3/4 inch).

G. Pea Rock: Grave or crushed limerock with 100 percent passing the 1-inch sieve and not more than 5 percent passing the 1/4 inch sieve.

H. Plastic Filter Fabric: Filter fabric conforming to Section 985 of the FDOT Specifications, and equal to Bidim By Monsanto Company. Typar by E.I. duPont de Nemours or Carthage Mills Filter X.

PART 3 - EXECUTION

3.01 PREPARATION

A. Pipe Trenches:

1. Excavate the pipe trenches to the widths necessary for the proper laying of the pipe and keeping the banks as nearly vertical and sheeted, if required, with the clearance between the pipe and trench wall or back of sheeting not exceeding 18". Excavate the bottom of the trenches to a depth of the outside bottom of the pipe barrel and replace any over excavation with suitable compacted material. For inlets and other appurtenances, make the excavation with suitable compacted material. For inlets and other appurtenances, make the excavation sufficient to provide a clearance between their outer vertical surfaces and the face of the excavation, or sheeting if used, of not less than 12 inches.

2. Remove for the full width of the excavation soft, spongy, or otherwise unstable material encountered below the established grade of the excavation which will not provide a firm foundation for subsequent work and replace with approved fill material.

3. Where sheeting and bracing are necessary to prevent caving of the trench sidewalls of excavation for other structures, and to safeguard the workmen, excavate the trench or excavation for other structures to such width that the proper allowance is made for the space occupied by the sheeting and bracing to provide clearance as specified above.

3.02 INSTALLATION

A. Concrete Pipe

1. Install concrete pipe carefully, true to the line and grade shown on the Drawings. Any deviation from true alignment or grade which would result in a displacement from normal position of the gasket of as much as 1/4-inch, or which would produce a gap exceeding 1/2 inch between sections of pipe for more than 1/3 of the circumference of the inside of the pipe, will not be acceptable and where such occurs, remove and reinstall the pipe, will not be acceptable and where such occurs, remove and reinstall the pipe without additional compensation. Use no mortar, joint compound, or other filler which would tend to restrict the flexibility of the gasket joint. Install pipes having defects that have not caused their rejection so that these defects will be in the upper half of the sheet.

2. Before installation of the pipe gasket, clean the gasket and the surface of the pipe joint, including the gasket recess free from grit, dirt, or other foreign matter. Application of an approved vegetable soap lubricant immediately prior to closing of the joint will be permitted.

3. Install all pipes with bells or grooves uphill. As the pipes are laid throughout the work, thoroughly clean and protect them from dirt and water. Lay no length of pipe until the two preceding lengths have been thoroughly embedded in place so as to prevent any movement or disturbance of the finished joint, and do not walk on or work over the pipes after they are laid, except as may be necessary in tamping earth and refilling, until they are covered to a depth of 1-foot. Place fill around the pipe on both sides simultaneously to approximately the same elevation and uniformly compacted. Whenever the pipe laying is discontinued, as at night, protect the unfinished end from displacement due to caving of the banks or from other injury and insert a suitable stopper.

B. Drainage Structures:

1. Construct concrete inlets and other structures in conformity with the Drawings. Design and construct forms so that they may be removed without injury to the concrete. Thoroughly compact the concrete and leave forms in place for at least 24 hours after concrete is poured. Cure the concrete for at least 5 days after removal of forms. Thoroughly clean honey-comb places, saturate with water and point up with mortar.

2. Precast inlets or other structures may be used in lieu of cast-in-place structures. Set grates in mortar to the proper line and grade.

3.03 BACKFILLING FOR PIPE AND STRUCTURES

A. After the pipe has been installed, place approved select material from excavation at a moisture content which will facilitate compaction alongside the pipe in layers not exceeding 6" loose measure in depth. Thoroughly compact the fill under the haunches of the pipe and compact each layer by rolling or tamping with mechanical rammers. Continue this method of filling and compacting until the fill is 12" above the pipe, then place the remainder of the backfill in lifts not exceeding 9". Operate heavy equipment in a manner so that no damage to the pipe will result. Compact backfill material 12 inches and more above the top of the pipe to not less than 95 percent of maximum density as determined by AASHTO T 180. Tests for density of compaction may be required at the option of Owner. Correct deficiencies without additional cost to Owner.

B. Place and compact backfill for drainage structures in the same manner as specified above for pipe, except allow the concrete to cure for not less than five days before placing the backfill.

C. Backfilling in Wet Trenches: After the installation of the pipe and drainage structures, place backfill material carefully, uniformly and simultaneously on both sides of the pipe of structure by carefully lowering the material into the trenches down to the water surface and then releasing it to settle through the water. Do not, under any circumstances, dump, push or shove backfill material into the wet trench. Carefully ram backfill material around both sides of the pipe to properly bed and support the pipe. No specified density will be require in wet trenches until the fill has reached a level 1 foot above the water, at which elevation and above the backfill densities specified above will apply.

END OF SECTION

SECTION 02730
SANITARY SEWERAGE SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section included furnishing all labor, materials, equipment, transportation and performing all work necessary to complete excavation, backfilling and grading as required for the construction of a complete system of sanitary sewer system consisting of pipes, manholes and appurtenant items as shown on Drawings and as specified herein.

B. Related Sections: The following sections contain requirements that related to this section.

1. Section 02220 - Excavating, Backfilling, and Compacting:

2. Section 03400 – Precast Concrete Structure

3. Section 03600 - Grout

1.03 QUALITY ASSURANCE

A. Design Requirements:

1. Install all sewer mains with a minimum cover of 36 inches below finished grade, unless otherwise indicated.

2. Construct sewer mains of the materials indicated on Drawings, unless otherwise directed by Owner.

3. Pipe used in gravity sewer construction shall be polyvinyl chloride (PVC) or ductile iron pipe (DIP). Where reference is made to an ASTM, ANSI, or AASHTO designation, it shall be the latest revision.

B. Pipe Inspection: Obtain from each pipe manufacturer a certificate of inspection to the effect that the pipe and fittings supplied for this contract have been inspected at the plant and that they meet the requirements of these specifications. Visually inspect all pipes and fittings at time of delivery and just before they are lowered into the trench to be laid. Reject and remove pipe, joints or fittings that are damaged or that do not conform to these Specifications.

1.04 SUBMITTALS

A. Submit shop drawings, working drawings and samples in accordance with general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections.

PART 2 - PRODUCTS

2.01 GRAVITY SEWER PIPES

A. PVC Pipe:

1. PVC Gravity Sewer Pipe (4"-15"), ASTM D3034, SDR 35. Uniform minimum "pipe stiffness" at five (5) percent deflection shall be 46 psi. The joints shall be integral bell elastomeric gasket joints manufactured in accordance with ASTM D3212 and ASTM F477. Applicable UNI-Bell Plastic Pipe Association standard is UNI-B-4.

2. PVC Gravity Sewer Pipe (18" - 27"), ASTM F679, SDR 35. Uniform Minimum "pipe stiffness" at five (5) percent deflection shall be 46 psi. The joints shall be integral bell elastomeric gasket joints manufactured in accordance with ASTM D3212 and ASTM F477. Applicable UNI-Bell Plastic Pipe Association standard is UNI-B-7.

3. All PVC pipe shall bear the NSF-DW seal. The minimum standard length of pipe shall be thirteen (13) feet.

B. Ductile Iron Pipe

1. Ductile iron pipe shall conform to ANSI/AWWA A21.51/C151, class thickness designed per ANSI/AWWA A21.50/C150, with mechanical or push on joints. An interior protective lining of coal tar epoxy shall be provided with a minimum dry thickness of 30 mils. Ductile iron gravity sewers, where shown on the drawings, shall be wrapped with polyethylene film, AWWA C105. The minimum standard length of pipe shall be eighteen (18) feet.

2.02 JOINT MATERIALS

A. PVC Pipe

1. PVC sewer pipe joints shall be flexible elastomeric seals per ASTM D 3212.

B. Ductile Iron Pipe

1. Ductile iron pipe and fitting joints shall be "push-on" or mechanical joints conforming to ANSI A21.11.

C. Joints For Dissimilar Pipe

1. Joints between pipes of different materials shall be made with a flexible mechanical compression coupling with No. 304 stainless steel bands.

2.03 PIPE FITTINGS

A. Unless otherwise specified, wye branches shall be provided in the gravity sewer main for service lateral connections. Wyes shall be six (6) inches inside diameter, unless otherwise approved by Owner. All fittings shall be of the same material as the pipe.

B. Plugs for stub outs shall be of the same material as the pipe, and gasketed with the same gasket material as the pipe joint, or be of material approved by Owner. The plug shall be secured to withstand test pressures specified in these specifications.

2.04 MANHOLES

A. General: Manholes shall be leak-tight and constructed of pre-cast concrete units.

B. Pre-cast Concrete Sections

1. Pre-cast manholes shall conform to specifications for Pre-cast Reinforced Concrete Manhole Sections, ASTM Designation C478, except as otherwise specified below.

2. The minimum wall thickness shall be 5 inches. Pre-cast manholes shall be constructed with a pre-cast monolithic base structure as shown on Standard Details Drawings. The minimum base thickness shall be 8 inches.

3. Concrete for manholes shall be Type II, 4000 psi at 28 days. Barrel, top and base sections shall have tongue and groove joints. All jointing material shall be cold adhesive preformed plastic gaskets, conforming with FDOT Article 942-2..

4. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on each pre-cast section.

5. Pre-cast concrete top slabs shall be used where cover over the top of the pipe is less than 4 ft. Lift rings or non-penetrating lift holes shall be provided for handling pre-cast manhole sections. Non-penetrating lift holes shall be filled with non-shrink grout after installation of the manhole sections.

6. Concrete surfaces shall have form oil, curing compounds, dust, dirt and other interfering materials removed by brush sand blasting and shall be fully cured prior to the application of any coatings.

7. Interior surfaces of manholes shall have a protective epoxy coal tar coating with a minimum dry mil thickness of 16 mils. Exterior surfaces shall have a protective epoxy coal tar coating with a minimum dry mil thickness of 9 mils. Coatings shall be applied in two (2) applications by the manhole manufacturer in strict accordance with the paint manufacturer's recommendations.

C. Castings

1. Gray iron castings for manhole frames, covers, adjustment rings and other items shall conform to the ASTM Designation A 48, Class 30. Castings shall be true to pattern in form and dimensions and free of pouring faults and other defects which would impair their strength, or otherwise make them unfit for the service intended. The seating surfaces between frames and covers shall be machined to fit true. No plugging or filling will be allowed. Lifting or "pick" holes shall be provided, but shall not penetrate the cover.

2. Casting patterns shall conform to those shown or indicated on the Standard Details. All manhole frames and covers shall be traffic bearing to meet AASHTO H-20 loadings. Frames shall be suitable for the future addition of a cast iron ring for upward adjustment of top elevation.

PART 3 - EXECUTION

3.01 PREPARATION

A. Trench Preparation And Pipe Bedding

1. Contractor shall hand-grade bedding to proper grade ahead of pipe laying operation. Bedding shall provide a firm, unyielding support along the entire pipe length.

2. If without direction from Owner, the trench has been excavated below the required depth for pipe bedding material placement, Contractor shall fill the excess depth with pipe bedding material to the proper grade.

3. Contractor shall excavate bell holes at each joint to permit proper assembly and inspection of the entire joint. Contractor shall provide pipe bedding material in accordance with the Standard Details Drawings

B. Gravity Pipe And Water Main Separation

1. Gravity sewers that are laid in the vicinity of pipe lines designated to carry potable water shall meet the horizontal (10 feet) and vertical (18 inches) separations.

3.02 PLUGS AND CONNECTIONS

A. Plugs for pipe branches, stubs or other open ends which are not to be immediately connected shall be made of an approved material and shall be secured in place with a joint comparable to the main line joint.

3.03 PIPE JOINTING

A. PVC sewer pipe joints shall be flexible elastomeric seals per ASTM D 3212.4.

B. Ductile Iron Pipe and fittings joints shall be "push-on" or mechanical joints conforming to ANSI A21.11.

3.04 MANHOLES

A. Bedding

1. Base sections shall be placed on bedding rock firmly tamped and made smooth and level to assure uniform contact and support of the pre-cast element.

B. Cast in place bases

1. Unless otherwise specified, cast-in-place bases shall be at least eight (8) inches in thickness and shall extend at least six (6) inches radially outside of the outside dimension of the manholes section. Reinforcement and connection to the riser sections shall be designed by Contractor and submitted to Owner for approval.

C. Pre-Cast Manholes

1. A pre-cast base section shall be carefully placed on the prepared bedding so as to be fully and uniformly supported in true alignment and making sure that all entering pipes can be inserted on proper grade.

2. Pre-cast manhole sections shall be handled by lift rings or non-penetrating lift holes. Such holes shall be filled with non-shrink grout after installation of the manhole.

3. The first pre-cast section shall be placed and carefully adjusted to true grade and alignment. All inlet pipes shall be properly installed so as to form an integral watertight unit. The sections shall be uniformly supported by the base structure, and shall not bear directly on any of the pipes.

4. Pre-cast sections shall be placed and aligned to provide vertical alignment with a 1/4-inch maximum tolerance per 5 feet of depth. The completed manhole shall be rigid, true to dimensions, and watertight.

D. Placing Castings

1. Casting shall be fully bedded in mortar with adjustment brick courses placed between the frame and manhole. Bricks shall be a minimum two (2) and maximum four (4) courses. Mortar shall conform to ASTM C-270, type M, and the bricks shall be clay and conform to ASTM C-216, grade SW, size 3 1/2" (w) x 8" (L) x 2 1/4" (h).

2. Top of manhole castings located in pavement, shouldered areas, and sidewalks shall be set flush with grade. Top of manhole castings located outside these areas shall be placed 2" above grade.

E. Channels

1. Manhole flow channels shall be as shown in the STANDARD DRAWINGS, with

smooth and carefully shaped bottoms, built up sides and benching constructed using cement and brick with no voids. Channels shall conform to the dimension of the adjacent pipe and provide changes in size, grade and alignment evenly. Cement shall be Portland Cement Type II only.

F. Pipe Connections

1. Special care shall be taken to see that the openings through which pipes enter the structure are provided with watertight connections.

2. For ductile iron and PVC pipe, connections shall conform with ASTM C 923, "Standard Specifications for Resilient Connectors between Reinforced Concrete Manhole Structures and Pipes."

3. For concrete pipe connection shall be made with non shrink nonmetallic grout.

3.05 INSPECTION AND TESTING

A. General

1. Each length of pipe shall bear the name or trademark of the manufacturer, the location of the manufacturing plant, and the class or strength classification of the pipe. The markings shall be plainly visible on the pipe barrel. Pipe which is not marked clearly is subject to rejection. All rejected pipe shall be promptly removed from the project site by the Contractor.

B. Miscellaneous Inspection And Testing Requirements

1. All pipe and accessories to be installed under this Contract shall be inspected and tested at the place of manufacture by the manufacturer as required by the Standard Specifications to which the material is manufactured.

2. Each length of pipe shall be subject to inspection and approval at the factory, point of delivery, and site of work. If requested by Owner, a sample of pipe to be tested shall be selected at random by Owner or the testing laboratory hired by Owner.

3. When the specimens tested conform to applicable standards, all pipe represented by such specimens shall be considered acceptable based on the test parameters measured. Copies of test reports shall be available before the pipe is installed in the project.

4. In the event that any of the test specimens fail to meet the applicable standards, all pipe represented by such tests shall be subjected to rejection.

5. The Contractor may furnish two additional test specimens from the same shipment or delivery, for each specimen that failed and the pipe will be considered acceptable if all of these additional specimens meet the requirements of the applicable standards. All such retesting shall be at the Contractor's expense.

6. Pipe which has been rejected by Owner shall be removed from the site of the work by the Contractor and replaced with pipe which meets these specifications.

30.6 CLEANING

A. All newly constructed manholes shall be cleaned of any accumulation of silt, debris, or foreign matter of any kind, and shall be free from such accumulations at the time of final inspection.

3.07 INSPECTION FOR ACCEPTANCE

A. No visible leakage in the manhole or at pipe connections will be permitted. All manholes shall be inspected by Owner prior to acceptance. All manholes failing to meet the specification shall be reconstructed or replaced by the Contractor to comply with these specifications. Pressure grouting of manholes for repair shall not be accepted.

END OF SECTION

SECTION 02810
IRRIGATION SYSTEM

PART 1 – GENERAL

1.1 SUMMARY

A. The work covered under this section includes supplying and installing all materials and equipment required for a complete operational automatic irrigation system.

B. The information herein contained indicates the types of materials, quality of workmanship, and manner of protection, which shall be complied with in effecting the irrigation system.

C. Completion of work shall mean the full and exact compliance and conformity with all the provisions of the Contract Documents.

1.2 SUBMITTALS

A. Provide manufacturer's product data sheets for each item specified.

B. Samples shall be specifically required for non-specified manufacturer's products submitted as a substitution.

C. Product certificates shall be required by manufacturers for products not specifically named on plans or in specifications certifying that each product furnished meets this specification, specifications shown on drawings and any individual project requirements for the purpose intended.

D. Provide complete materials list.

1.3 RELATED WORK

A. The Contractor shall fully acquaint himself with related planting, paving, site, and utilities work described elsewhere in the Contract Documents to preclude any misunderstandings and to facilitate a trouble-free irrigation system.

B. Electrical service to controller shall be provided by electrical subcontractor and shall be in compliance with NEC requirements. Coordinate with DIVISION 16 for voltage requirements.

C. See SECTION 02900 - LANDSCAPING and SECTION 02930 - GRASSING

D. See DIVISION TWO – EARTHWORK (and related referenced sections) for excavating, trenching and backfilling.

1.4 QUALITY ASSURANCE

A. Landscape irrigation system installation shall only be performed by a firm that has a minimum of five (5) years full time experience with similar projects in the installation of underground landscape irrigation systems. The firm shall be state certified or a licensed sub-contractor or a locally registered subcontractor in Orange County, Florida. Crews shall be controlled and directed by a foreman who is thoroughly familiar with the type of materials being installed and the manufacturer's recommended methods of installation.

B. Manufacturer’s Qualifications: Employ only manufacturers with at least five (5) years experience making the specified materials as a current catalog and regular production item.

1.5 DESIGN MODIFICATIONS

A. Slight layout modifications may be made only as necessary to meet field conditions and only as acceptable to the Owner’s Representative. Piping shown on drawings is diagrammatically routed for clarity - route to avoid conflict with underground utilities, existing and specimen plants and adjust as necessary to landscape construction.

B. Design Criteria: The Owner’s Representative shall have the right, at any stage of the operations, to reject any and all work and materials that, in his opinion, do not comply with the requirements of the Contract Documents. Such rejected work or material shall be immediately removed from the site and acceptable work or material substituted in its place.

C. Contractor shall be responsible for verification at the site of all conditions and dimensions shown on the drawings prior to commencement of work.

1.6 REQUIREMENTS OF REGULATORY AGENCIES

A. Work shall comply with applicable codes, ordinances and regulations of all governing authorities including the current Florida Building Code.

1.7 AS-BUILT DRAWING/CLOSEOUT SUBMITTALS

A. After completion of piping installation, the Contractor shall furnish to the Owner’s Representative a reproducible "AS-BUILT" drawing showing all sprinkler heads, valves, and pipelines to reasonable scale, and provide a minimum of two dimensions taken from fixed obvious objects to point of connection, directional turns of all mainline piping, each automatic and manual control valve, and quick coupling valve. The plans shall be provided on or before the date of work review for provisional acceptance.

1. The Contractor shall also furnish a drawing showing a graphic representation of sprinkler zones and recommendations for controller time settings for each valve.

B. Instruction sheets and parts lists covering all operating equipment shall be bound into folders and furnished to the Owner's Representative.

C. Backflow preventer test report (passing) – See 2.11.A. this section.

1.8 UTILITIES

A. Prior to excavation, verify in the field the location and depth of all new and existing utilities and other work that may be damaged by the Contractor's work.

1.9 GUARANTEES

A. The Contractor shall furnish warranties, in writing, certifying that the quality and workmanship of all materials and installation furnished is in accordance with the Contract Documents, Division One of the Project Manual and in accordance with the original manufacturer's warranties.

1. The Contractor shall be responsible for the fulfillment of all manufacturers' warranties.

2. The Contractor shall guarantee materials and workmanship for a period of one year from date of granting Substantial Completion by Owner or as stated in Division One of the Project Manual, whichever is greater.

B. The Contractor is responsible for protection of the work until the date of Final Completion.

C. The Contractor shall provide the Owner with a written guarantee.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Materials and equipment shall be new and shall operate at the manufacturer's published capacities.

2.2 PIPE

A. Comply with the following unless otherwise indicated: All PVC mainline pipe shall be CL 200 ASTM D-2241, all PVC lateral pipe shall be CL 200 ASTM D-2241.

B. All crossings (sleeves) under paved areas shall be Schedule 40 PVC, ASTM D-1785.

C. For PVC plastic pipe, ASTM D-2466 socket fittings with ASTM A-2564 solvent cement.

2.3 CONTROLLER

A. The Contractor shall furnish electric controller(s) as indicated on the drawings and as specified herein. Ground controller as shown on drawings and per manufacturer's direction.

1. The controller(s) shall be installed in the area(s) shown on the drawings.

2. All electrical connections are the responsibility of the Contractor.

3. A typewritten plastic laminated legend shall be attached inside the controller(s) door stating the areas covered by each remote control valve.

2.4 SPRINKLER HEADS

A. Sprinkler heads and bubblers shall be of the type shown or scheduled on the drawings.

2.5 FLEX CONNECTIONS

B. Flex connections shall be PVC flex pipe with glued fittings as detailed, or approved equal.

2.6 GATE VALVES

A. Shall be all brass body, or approved equal.

2.7 REMOTE CONTROL VALVES

A. Valves shall be as specified on the drawings. Use Teflon tape only on threaded connections.

2.8 VALVE BOXES

A. Valve boxes (bodies and covers) shall be 11" x 17" or 12" x 17" rectangular box as shown in the details or approved equal installed flush with finish grade.

2.9 CONTROL WIRING

A. All wiring to automatic circuit valves shall be UF-14 (14 gauge) UL approved, direct burial wire of a different color than the black and white wires used on the 115 volt AC power.

B. Wiring from the controller to the valves shall be installed in same trench as the mainline where possible. Where wires are not placed in the trench with the mainline, install in Schedule 40 PVC conduit, minimum of 18” below grade.

C. All splices shall be made with 3M DBR/Y connectors, or approved equal.

D. All wire shall be furnished in minimum 2,500' reels and spliced only at valve or tee locations. All splices shall be contained in a valve box.

2.11 WELL

A. Furnish a well and pump at the location and as specified on drawings or a directed by the Owner’s representative at the time of the work. Installation shall comply with applicable regulatory agencies. Provide all testing and obtain approvals.

2.12 SOLVENT CEMENT/SOLVENT & CLEANER

A. Solvent Cement shall comply with ASTM A 2546.

B. Solvent and cleaner: Uni-weld 1600. Solvent and cleaner for flex pipe to be specifically for PVC flex pipe.

PART 3 – EXECUTION

3.1 INSPECTION

A. Contractor shall examine the areas and conditions under which landscape irrigation system is to be installed and notify the Owner in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 COORDINATION

A. Contractor shall install crossings (sleeves) under paved areas (such as sidewalks, roadways and parking lots) as indicated and at depths indicated on the details.

B. Crossings shall be installed prior to construction of paving.

C. The Contractor shall be responsible for coordinating his work with all other parties involved with the project, and shall coordinate the supply of electrical power to the Timing Device (controller) and tie-in into grounding system.

D. The Contractor shall be responsible for full and complete coverage of all irrigated areas and shall make any necessary minor adjustments at no additional cost to the Owner.

3.3 EXCAVATING AND TRENCHING

A. Perform all excavations as required for the installation of the work included under this section, including shoring of earth banks to prevent cave-ins. Where major root systems of large existing trees are encountered, including roots 4” diameter or larger, tunnel to avoid cutting the roots. Use caution while working in the gas main easement.

B. Restore all surfaces, existing underground installations, damaged or cut as a result of excavations to their original conditions.

C. Trenches for pipelines shall be made of sufficient depth to provide the minimum cover from finish grade as follows:

1. 18" minimum cover over main lines and control wires.
2. 24" minimum cover over sleeves (crossings).
3. 18" minimum cover over lateral lines to heads.

D. Where possible, install pipe adjacent to curbs or paving to minimize interference with plants and their roots.

E. Keep trenches free of obstruction and debris. Remove excess soil from the site and leave grade as it was prior to irrigation system installation.

F. Piping shall be routed around shrubs, trees and other permanent obstacles.

3.4 PIPE LINE ASSEMBLY

A. Install plastic pipe as recommended by the manufacturer and provide for expansion and contraction. Cut plastic pipe square. Remove burrs at cut ends prior to installation so that a smooth unobstructed flow will be obtained. Provide continuous support of the pipe using an unobstructed even trench bottom that is free of debris.

B. Install remote control valves at locations no closer than 12" to weld edges, buildings, and walls. Plastic pipe fittings shall be solvent welded using solvents and methods as recommended by manufacturer of the pipe, except where screwed connections are required. Pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before applying solvent with a non-synthetic bristle brush. Care should be taken not to use an excess amount of solvent, thereby causing a burr or obstruction to form on the inside of the pipe. Allow the joints to set at least 24 hours before applying pressure to PVC pipe. Flush main and lateral piping on irrigation system to clean out all debris and sediment prior to the installation of heads and nozzles.

C. Sprinkler heads shall be installed so that the top is slightly above finish grade. If finish grade has not been established, set the top of the sprinkler head 4" above grade and lower the sprinkler head when finish grade has been established and sod/mulch has been installed. Heads along curbs and walks shall be set flush to within 1/8" and 6" away from curb or walk. Heads and piping adjacent to buildings shall be a minimum of

12” off face of building. No application of water shall be made within 12” of the exterior building walls. Adjust heads having an adjustment stem, for the proper radius and throw for the area involved. Do not allow over-spray on buildings, walkways or on motor vehicles.

D. All control wires shall be installed in a neat and orderly fashion underneath the main and lateral pipes, if possible. 10" loops shall be provided at each valve where control wires are connected.

E. All piping and wiring passing under existing or future paving, construction, etc., shall be encased in sleeves as specified, extending at least 12" beyond edges of paving base or construction.

F. Install warning tape directly above pressure piping, 12 inches below finish grade except under paving or slabs or where depth shall be 6 inches.

3.5 BACKFILLING AND COMPACTING

A. After pressure testing is complete and systems are approved, or sections thereof, backfill excavations and trenches with clean soil, free of rubbish. Dress off all areas to finish grades. Repeat backfilling as required due to settlement.

B. Balance and adjust the irrigation system components for efficient, proper operation. This includes controller synchronization as well as individual controller stations, valves and sprinkler head adjustments. Do not allow over-spray on buildings, walkways or other paving or on automobiles.

3.6 RAIN SENSOR

A. Install rain sensor on exposed surface that is unobstructed from rainfall. Install rain sensor control wiring in rigid conduit.

3.7 LABELS

A. Number each zone valve box on inside of valve box on plastic Christy tags for reference. Numbers shall match the zone numbers on the drawings.

B. Number each zone valve control wire at the controller with a waterproof marker and tags. Numbers shall match the zone numbers on the drawings.

3.8 PRESSURE TESTING/SYSTEM DEMONSTRATION

A. All piping, connectors and valves shall be hydrostatically pressure tested. The mainline test shall last for a minimum of four (4) hours at 100 PSI. All leak areas and equipment shall be replaced and the system shall be re-tested until no leaks are found.

All testing shall be done before backfilling trenches.

B. Provide a complete demonstration to the Owner's Authorized Representative of the operation of all components of the irrigation system as part of Close Out procedures.

C. Provide complete typewritten instructions for operation including recommended watering times, duration and preventative maintenance.

3.9 MAINTENANCE

A. Maintain the irrigation system until the date of Final Completion.

B. Maintenance shall include work, materials and replacements necessary to insure a complete properly operating system.

3.10 OWNERS RESPONSIBILITY FOR MAINTENANCE

A. It is be the Owner's responsibility to maintain the system in working order during the guarantee period, performing necessary minor maintenance, keeping grass from obstructing the sprinkler heads and preventing vandalism and damage during the landscape maintenance operation.

3.11 CLEAN-UP

A. Upon completion and prior to inspection of the work, clear the site of debris, superfluous materials and equipment.

END OF SECTION 02810

SECTION 02831
CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.01 REALTED DOCUMETNS

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

1.02 SUMMARY

A. This Section included furnishing all labor, material, equipment, transportation and performing all work necessary for the construction of a galvanized steel chain link fence, nominally 8-feet high, complete with gate as shown on the Drawings.

PART 2 - PRODUCTS

2.01 MATERIAL

A. Fabric: 60 inches high, No. 9 gauge galvanized wire, woven in a 2-inch mesh with top and bottom selvage with knuckle knuckle edge. Use steel wire uniformly galvanized in accordance with ASTM A 641, Class I coating.

B. Posts and other Appurtenances: Pipe sections conforming to ASTM A 53, hot dipped galvanized with a minimum of 1.8 ounces per square foot of surface.

C. Sizes of Posts, Gate Frames and Rails: Use posts, frames and rails conforming to the following sizes. Square posts, frames and rails conforming to the following sizes. Square posts and frames may be substituted for the listed members if test data can be supplied to show equal or greater bending strength.

DIMENSIONS IN INCHES

Designation	Nominal Diameter	Outside Diameter	Thickness	Pounds Per Foot Plain Ends
1. *End, corner & pull posts:	2 ½	2.875	0.203	5.79
2. *Gate posts (one leaf width over 13 feet):	6	6.625	0.280	18.97
3. *Gate posts (one leaf width 6 feet to 13 feet):	3 ½	4.000	0.226	9.11
4. *Gate posts (one leaf width 6 feet or less)	2 1/2	2.875	0.203	5.79
5. Intermediate posts:	2	2.375	0.154	3.65
6. Gate frames:	1 ½	1.900	0.145	2.72
7. Braces	1 ¼	1.660	0.140	2.27
8. Top rails:	1 ¼	1.660	0.140	2.27

*Posts shall be schedule 40 galvanized steel.

A. Gates:

1. Swing Gates: Provide gates with frames constructed of round or square tubular members continuously welded at all corners or assembled with fittings, with gate filler of same fabric as the fence and attached securely to the gate frame at intervals not exceeding 14 inches, with hinges of adequate strength for the gate and with large bearing surfaces for clamping in position, so that the hinges do not twist or turn under the action of the gate. Provide gates that are easily operable by one person, and provide latches, stops and keepers for all gates, with provision for padlocking.

2. Padlock: Schlage No. 45-101 case-brass, shackle-case hardened steel, 1-inch length with 9 inches of chain, 606 finish and keyed alike when more than one, unless otherwise specified or noted on the Drawing.

B. Top Rail: Couplings of the outside sleeve type, at least 6-inches long, approximately every 20 feet.

C. Concrete: Class B (3,000 psi) conforming to Section 03300.

D. Hardware: Steel, malleable iron or ductile iron of standard design and conforming to the requirements of the Chain Link Fence Manufacturer's Institute, with all parts galvanized except ties and clips may be of aluminum.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clearing: Provide the necessary clearing for installation of the fences and for access to the work.

3.02 ARRANGEMENT

A. Posts: Install posts uniformly spaced, not to exceed 10-feet on centers with intermediate posts having waterproof tops and integrally cast openings through which the top rails shall pass.

B. Braces: Provide at each gate, corner, pull and end post.

C. Top Brace Rails: Securely fasten the top brace rail to the terminal posts and line posts by heavy pressed steel brace bands and malleable end connections.

D Top and Bottom Tension Wire: coiled spring No. 9 gauge galvanized steel wire coated, stretched taut between terminal posts and securely fastened to each intermediate post 2 inches below top of fabric and 6 inches above the finish grade line respectively. Attach tension wires to the fence fabric with 9 gauge wire hog rings every 24 inches.

E. Stretcher Bars: 3/16-inch x 3/4-inch minimum in cross section and having a minimum length 2 inches shorter than the fabric height. Use stretcher bars for attaching the fabric to all terminal posts by threading through the fabric and attaching to the posts with 11 gauge tension bands, or other positive mechanical means, spaced at 12-inch centers. Provide one stretcher bar for each gate and end post and two for each corner and pull post.

F. Ties and Clips: Fasten fabric to all intermediate posts with 9 gauge tie wires, spacing not to exceed 14-inches apart and to top rail with 9 gauge tie wires with spacing not to exceed 24 inches on centers.

3.03 INSTALLATION

A. Post Setting: Set line posts in holes 12 inches in diameter, 38 inches deep with 36-nch post embedment, terminal posts in holes 15 inches diameter, 38 inches deep with 36-inch post embedment and after the post has been set and plumbed, fill the hole with concrete. Crown the exposed surface of the concrete to shed water.

B. Terminal and Gate Posts: Set as specified above and brace to the nearest post with a galvanized horizontal brace used as a compression member and a galvanized 3/8-inch steel truss rod and truss tightener used as a tension member.

C. Fabric and Tension Wires: Do not stretch fabric and tension wires until concrete footings have cured a minimum of three days. Place chain link fabric on the side designated by Owner and stretch taut approximately 2 inches above finish grade, then

securely fasten to all posts and tension wires. Join rolls of wire fabric by weaving a single strand into the ends of the rolls to form a continuous mesh.

END OF SECTION

SECTION 02900
LANDSCAPING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes provisions for furnishing all labor, materials and supervision required for the installation and establishment of all trees, shrubs, groundcovers, grassing and associated work of the species, size and quality indicated herein and on the drawings.

B. Work shall include fine grading, taxes and permits.

1.2 RELATED WORK

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

B. Section 02810 - Irrigation System

C. Section 02930– Sodding

1.3 QUALITY ASSURANCE

A. General: Comply with applicable standards.

B. Grades and Standards for Nursery Plants, Latest Edition, Division of Plant Industry, Florida Department of Agriculture and Consumer Services.

C. American Standard for Nursery Stock, ANSI Z60.1, Latest Edition, American Nursery and Landscape Association.

D. All Federal, State, and Local Governing Agency requirements and industry standards applicable to this section are hereby made part of this specification.

E. Work shall not commence until all permits applicable to this section have been secured.

F. The Owner's Representative shall have the right at any stage of the construction operation to reject any and all work and materials, which, in their opinion, do not meet the requirements of these specifications. Such rejected work and materials shall be immediately removed from the site and replaced in an acceptable manner.

G. Substitutions permitted only upon submission of proof that any specified plant is not obtainable or suitable for the location as specified on the plan and upon written authorization.

H. All work to be provided by personnel familiar with planting procedures and under the supervision of a qualified and experienced foreman who shall be at the site when planting operations are in progress.

I. Provide certification by a Florida Division of Plant Industry representative or other approved independent certified horticulturist, botanist or agricultural laboratory that all materials comply with specified genus, species, variety, grade and standard.

1.4 SUBMITTALS

A. Provide for approval a Planting Installation Schedule showing dates for starting each type of planting in each area of the site. Coordinate with other work on site and submit for approval. Schedule to be approved prior to construction kickoff meeting. Update schedule periodically to be consistent with overall project schedule.

B. Prior to starting work, submit photographs of representative quality of all trees to be installed. Submit the source and location of supplier of all materials. All plant materials shall be available at the source for inspection prior to delivery to the site. All trees shall be pre-tagged by the Owner's Representative and Landscape Architect prior to delivery to the site and planting.

C. Provide a list of all non-plant materials to be installed on the job, listing quantity and specification.

D. Submit samples, certificates and reports a minimum of two weeks prior to the installation of any of the materials. Work shall not begin until the Owner's Representative has approved all submittals. Submittals required, but not limited to the following:

1. Existing soil analysis test report
2. Prepared planting soil analysis test report and sample
3. Plant samples and photographs
4. Mulch
5. Sod

E. Submit manufacturer's cut sheets and analysis for all non-plant materials, including erosion control fabric, herbicides, drainage gravel, and ADS pipe that may be required to perform the work.

F. Submit soils test report and recommendations on soil samples taken from site after clearing of native vegetation and all fill is placed.

G. Submit a proposed planting schedule indicating sequence of planting for each area of the site and state time anticipated for each installation operation.

1.5 WARRANTY

A. Warranty all plant materials, except turf grass, for a period of one year from the date of substantial completion against defects including death and unsatisfactory growth, except for defects resulting from neglect by Owner and their agent, abuse or damage by others, or unusual phenomena which are beyond the Contractor's control. The warranty shall be submitted in writing to the Owner and shall state the name of the Owner, provide full guarantee terms, effective and termination dates, name of contractor providing guarantee, address, and telephone number. It shall be signed by the chief executive of the company and shall be notarized.

B. Plants that show indication of probable non-survival or lack of health and vigor, or at anytime do not exhibit the characteristics to meet the specifications or Grades and Standards, shall be replaced immediately or within two weeks of notice from the Owner's Representative. All replacement plants shall be furnished and installed at no additional cost to the Owner. Replacement plants shall be guaranteed until the end of the guarantee period, but not less than 6 months. All replacements shall meet original specifications.

1.6 PROTECTION

A. Provide and maintain all necessary safeguards for the protection of the public and protect all materials and work against damage from any cause. The Contractor shall be held responsible for any damage, disruption of service, cost of restoration, work of other trades at the site or injury to persons or property that may occur as a result of his negligence in the course of the work. The Owner's designated contractor shall restore any damage and the cost of this will be paid by the Contractor.

1.7 EXISTING CONDITIONS

A. The plans show conditions as they are believed to exist and are not intended as a representation by or on behalf of the Owner that such conditions actually exist. The Contractor shall inspect the job site prior to any work, report all differences and unsatisfactory conditions to the Owner's Representative and Landscape Architect for instructions to proceed. Do not proceed until conditions have been corrected satisfactorily. All unfavorable conditions encountered during the execution of the work shall be brought to the immediate attention of the Owner's Representative.

B. Locate all utilities, subsurface drainage and underground construction prior to commencing any work. Properly maintain and protect all utilities in place. Hand excavate within 5' of all utilities.

C. Repair immediately any damage to the work of others caused in the course of work including, but not limited to, utilities, structures, pavement, proposed and existing grades, proposed and existing vegetation.

D. Dispose of any objectionable materials encountered during the installation operations.

E. Coordinate work with all other parties involved with the job.

F. Maintain grade stakes set by others until parties concerned mutually agree upon removal.

PART 2 - PRODUCTS

2.1 PLANT MATERIALS

A. Provide plant materials as designated on the Plant List on the drawings of a minimum of Florida Grades and Standards No. 1. Plants shall be supplied in containers no less than the size specified. All plants shall be typical of their species and variety; sound, healthy and vigorous, well branched and shaped within normal habit of growth, of proper color, and densely foliated when in leaf. Plants shall have healthy, well-developed root systems that completely bind all of the soil in their containers, but shall not be root bound and shall be free of disease and insect pests, eggs, or larvae.

B. Trees: Symmetrically and uniformly branched on all sides, typical of habit of growth for the species. Multiple trunk trees shall have several main trunks well balanced around an imaginary central axis, emanating from a compact group of trunks at soil level, to produce a vase shaped branching structure. Standard trees shall have a single straight trunk and well-developed main leader. Trees that have been topped will not be accepted. Provide height, caliper and clear trunk shown on plans and schedules. All specified sizes are the minimum acceptable. Caliper to be taken six (6) inches above ground level up to and including four (4) inch caliper trees and twelve (12) inches above ground level for larger trees.

C. Palms and Cycads: Of the height and spread as shown and listed and consistent with Florida Grades and Standards No. 1.

2.2 PLANTING SOIL MIXTURE

A. Soil mixture: Determine final soil mix after soil tests. Soil analysis testing shall include measurements of infiltration or percolation rates, percentages of large and small capillary pores, total pore space, percentage of water holding capacity on a weight basis, textural classification and breakdown of sand fractions, pH, total soluble salts, percentage organic, cation exchange capacity and all major and minor nutrients present. Topsoil for soil mix shall be friable, loamy surface soil from well drained sources, reasonably free of subsurface soil, clay lumps, roots, stones and weeds and any other extraneous materials that would not be suitable for backfill of planting holes. Soil reaction shall range from pH 5.8 to pH 6.5 inclusive. Maximum soluble salts are 300 PPM. Soil mixture to be one-thirds acceptable natural topsoil, one-third Florida pulverized peat and one-third clean D.O.T. sand, thoroughly blended by mechanical means. Soil mixture is to be adjusted when approved by the Owner’s representative if test results indicate changes are necessary.

B. At Contractor's expense test representative samples from various locations around the site representing a range of future uses for pH, percentage organic content, permeability, minor elements and available nutrients.

C. Improve the planting soil based on individual site conditions and proposed plant type and as recommended by the soil test results by the addition of approved amendments.

D. All topsoil and planting soil shall be treated with a pre-emergent herbicide prior to installation of plant materials.

E. Planting soil mixture shall be used in all planting, at the quantities necessary, as shown on the details and required for installation of the plant materials.

2.3 FERTILIZER

A. General: All fertilizer applications shall be based upon a review of the soils tests results and laboratory recommendations and as directed by the Owner's Representative. Complete fertilizer of neutral character, with at least 50% of the nitrogen derived from a non-water soluble organic source and all potash to be derived from triple super sulfate forms for all plantings. Fertilizer shall contain minor elements and nutrients suitable for specified plants. All fertilizer to be slow release.

B. At planting, fertilize trees with a slow release fertilizer recommended in the soils test report. For bidding purposes provide cost of fertilizer with a 1-1-1 ratio equal to Polyon or Nuticote 13-13-13, type 180. In addition, all palms shall be treated with Lutz's or Jobe's manganese or magnesium fertilizer spikes. Fertilizer subsequently used shall be slow release 4-2-4 ratio fertilizer. Surface applied fertilizers shall be applied in the presence of an Owner's Representative.

C. Fertilizer lawns to provide not less than one pound of actual nitrogen per 1,000 square feet of area.

Provide nitrogen in form that will be available to lawn during initial period of growth; at least 50% of nitrogen to be organic form. Use fertilizer recommended in the soils report, derived from ammonium sulfate and containing micronutrients for specified lawns, unless soil tests recommendations stipulate otherwise.

2.4 MULCH

A. Provide 2"- 3" compressed depth of "Mimi" pine bark mulch for plantings and tree rings.

2.5 GUYING AND STAKING MATERIAL

A. As shown on the drawings..

2.6 GRAVEL SUBDRAIN

A. When requested by the Owner's Representative, install subdrains beneath trees and planting areas as directed using 6" perforated flexible PVC pipe with sock to aid in soil drainage and percolation. Drainage gravel shall consist of washed, clean gravel ¾ inch to 2 inches in size, and will be of such mineral composition that it will not adversely affect the plant. Provide unit cost for one-foot length of subdrain.

2.7 SOIL SEPARATION MAT

A. When requested provide soil separation mat Bidim (gray felt), as manufactured by Monsanto Co., 800 North Lindbergh Road, St. Louis, MO63166 or approved equal. Edges to overlap a minimum of 4 inches. Prevent tearing or crushing during installation. Provide unit cost for 10' x 10' area.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that grading operations have been completed and that final grades have been set and grading is complete and water for planting and maintenance is available prior to the installation of trees. Verify that the irrigation system is operational and fully tested and that the specified number of bubblers for each location is in place.

B. Protect trees during delivery to prevent damage to root ball, trunk and branches and desiccation of leaves. Cover entire trees with tarps during transport. Trees to be free from chain marks, girdling or other damage, any of these will render the tree unacceptable. All plants shall be handled by the root ball or container, not stem or trunk. Do not store plants on site. All plants to be delivered within 24 hours of planting.

C. Pesticide and herbicide materials shall be delivered to the site in original unopened containers with legible labels.

D. The Contractor shall assume full responsibility for protection and safekeeping of products stored on the job site.

D. Fine grade all planting areas immediately prior to planting to remove all noticeable irregularities or unevenness of surface grade. Water shall not be trapped behind curbs and established drainage patterns shall not be altered. Do not alter final grades that have been established or cause damage to previously established turf or planted areas, or trees retained on site. All tree protection barriers around retained trees shall not be disturbed.

F. Verify the location of underground utilities, irrigation heads and valves, and provide markers or other suitable protection, where necessary, to prevent damage.

G. Stake or flag tree locations for approval by Owner's Representative prior to installation and to determine potential conflicts with unforeseen obstacles, inconsistencies between plans and field conditions, and any other circumstances that might preclude the planting of trees as indicated on the plans. If such conflicts are encountered, notify the Owner's Representative prior to proceeding. Make adjustments to locations as directed to achieve project objectives. The relative position of each tree and plant is subject to approval by the Owner's representative, and shall be relocated as directed at no additional cost to the Owner.

H. Lay out plant beds encircling groups of trees with smooth bed lines.

I. Provide an acceptable soil mixture in an around the root zone of all plants, including the root balls of trees when indicated on the drawings.

J. Treat planting areas with the post-emergent herbicide Round-up, and the pre-emergent herbicide Ronstar, according to the manufacturers' recommended instructions and application rates as necessary to eliminate present and future weeds. Correct weed outbreaks in plant beds prior to acceptance.

K. Verify all grades prior to placing sod. Do not interrupt drainage patterns. Scarify or loosen the area over which the sod is to be placed to a depth of approximately 4 inches and rake smooth to eliminate surface irregularities. Remove rocks, stones and other debris. Fine grade and moisten all areas to be sodded immediately prior to sod placement. Grade 1 ½ inch to 2" below adjacent walks, curbs and pavement to allow for the thickness of sod, resulting in a flush condition of soil with paved surface after placement of sod. Strip to bare soil, scarify and loosen soil and fine grade areas to be sodded that have existing herbaceous vegetation, including existing sod when indicated on the drawings.

3.2 INSTALLATION

A. Provide plant holes cylindrical in shape with vertical sides. Holes for containerized plants shall be twice the diameter and the depth of the container. Holes for B&B plants shall be ball diameter plus 2' and ball depth of the tree. Loosen hard soils to encourage root growth beyond the planting hole.

B. Test, twice in succession, a representative number of plant holes in each area for vertical drainage prior to planting. Test drainage in presence of the construction manager. Fill each hole full of water and measure the water level after one hour and each successive hour. Note length of time required for each hole to drain. Notify the Landscape Architect prior to planting in areas of inadequate drainage.

C. Backfill and compact prepared planting soil mixture sufficiently in the bottom of the planting hole to support the root ball at the correct height relative to surrounding grade.

D. Place plants in the planting holes and orient to present best appearance from the most prominent viewpoints.

E. Backfill and tamp planting soil around the root ball to one-half the depth of the root ball. Water and rod-in to remove air. Then backfill and tamp additional planting soil to bring the soil even with the surrounding grade.

F. Form an earthen saucer 6" high around individual trees for retaining water. Inside diameter of the saucer shall be equal to the diameter of the planting hole. Maintain saucers until the date of substantial completion. Remove saucers from trees in grass areas when sod is installed.

G. Water-in thoroughly immediately after planting with a hose to eliminate air pockets and completely wet the root ball and planting soil. Backfill any voids with additional prepared planting soil.

H. Top dress all plant beds and tree holes with a 3" layer of mulch within 24 hours after planting.

I. All plants shall be straight and plumb and root balls shall be at proper grade after planting. Replant or straighten plants that have settled or are leaning until end of guarantee period.

J. Supplemental hand watering is required on an as needed basis. Apply water to trees at a rate of 5-7 gallons per inch of caliper, a minimum of three days a week, to maintain a moist condition until final completion. Each time plants are watered, water completely using a slow-soak technique, saturating the root ball to its full depth. Water sod to obtain optimal conditions for plant establishment and growth.

K. After planting of trees sod shall be placed to present an even and consistent cover with tight butt joints and without openings and overlaps. Sod shall be cut to fit irregular spaces and pieces shall be one-half the size of a pad or more. On slopes alternate joints between pieces and place pieces perpendicular to the slope.

3.3 STAKING AND GUYING

A. Maintain the stability and plumb condition of all trees. Provide guying as detailed and specified and maintain at all times.

3.4 FERTILIZER

A. Apply fertilizer to the soil in the quantities recommended in soils tests, distributed evenly around the root ball.

3.5 PRUNING

A. Prune in accordance with standard horticultural practice. Limit pruning to the removal of dead or injured branches, unless otherwise directed by the Owner’s Representative.

B. Remove dead wood immediately, routinely and spontaneously without prompting from the Owner's Representative.

C. Remove from the site and replace immediately trees that fail to meet size and quality specifications after the removal of dead wood.

3.6 MAINTENANCE

A. Begin maintenance immediately after planting. Maintain all plant material until the date of final completion. Maintain to assure vigorous, healthy growing conditions and shall include, but not be limited to, watering, weeding, mowing, pruning, fertilization, disease and pest control, replacement of non-conforming plants and sod, straightening, and all other procedures consistent with good horticultural practice. During maintenance perform all seasonal maintenance.

B. Mow sod regularly until date of final completion. Do not remove more than one-half the leaf blade at a single mowing. Resod as necessary for full even coverage. Fill all depressions and eroded channels to adjust grade to assure proper drainage.

3.7 FIELD QUALITY CONTROL

A. The Owner's Representative shall inspect the work at any time during the course of the construction activities to ensure adherence to the plans and specifications.

B. Upon completion of all work in this section, an inspection for acceptance of the work will be held. Notify the Owner's Representative at least seven days prior to the anticipated inspection date.

C. At the time all work is found to be acceptable, a letter of acceptance or certificate of substantial completion will be issued stating the date the guarantee period shall begin. Minor deficiencies shall be rectified within 3 days of the inspection date. If there are significant deficiencies found during the inspection, such work shall be corrected prior to the issuance of the letter of acceptance

3.8 CLEANING

A. Keep the premises free from accumulations of waste materials or rubbish at all times. Dispose of all waste materials properly off-site no less than weekly.

B. Upon completion, remove all excess subsoil, cordage, wrapping and other extraneous materials from the site. Remove all tools, equipment and other materials, except those necessary for maintenance work. Remove litter and debris occurring from maintenance work.

3.9 ACCEPTANCE

A. When the work is complete an inspection for acceptance shall be made upon written request of the Contractor. All plant materials shall be healthy, well-rooted, evenly colored for plant type, viable and free of weeds and disease.

B. A substantial completion inspection shall be conducted with all deficiencies noted and given to the Contractor to be corrected. Final completion acceptance will be issued only when all items have been completed and a re-inspection by the Owner finds the work to be complete and satisfactory.

C. At the conclusion of the warranty period an inspection will be made to determine the condition of the materials and the work. Remove all materials not in a healthy-growing condition and replace at no additional cost, with material of like kind and size in accordance with the specification for the original plant. Warranty replaced material for the specified period. In addition, remove all tree stakes and guys and dispose of off site.

END OF SECTION 02900

SECTION 02930
SODDING

PART 1- GENERAL

1.1 SUMMARY

A. Provide all labor, materials, equipment and incidentals required to prepare lawn bed, install sod, seeding or sprigs and repair existing sod in accordance with the drawings, scheduled mowing, and all work that is part of the 30-day grow-in period, and as specified.

B. Secure and pay applicable taxes and permits.

1.2 RELATED DOCUMENTS

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

B. Section 02810 – Irrigation System

C. Section 02900 - Landscaping

1.3 SUBMITTALS

A. Certificate and Guarantee

1. Growers' Certification and Guarantee

a. All sod shall be Florida Standard Grade sod as defined by the Florida Turf Producer Association that is true to botanical variety and 98% free of weeds and foreign grasses.
b. Florida Standard Grade may have no visible broadleaf weeds when viewed from a standing position and the turf shall be visibly consistent with no obvious patches of foreign grasses. In no case may the amount of foreign grasses or weeds exceed 2% of the total. The sod shall be neatly mowed and be mature enough that when grasped at one end, it can be picked up and handled without damage.
c. Certify grass species and variety with date and location of field from which sod was cut. One certificate per load is required.
d. Compliance with State and Federal quarantine restriction, if applicable.

2. Manufacturer's certification of fertilizer and herbicide composition.

3. Contractor shall submit all certification, reports and documentation to the Owner's Representative a minimum of one month prior to installation.

B. Provide Florida Department of Agriculture, Bureau of Plant Industry inspection certificates at time of delivery of sod.

C. Submit soils tests for all sod areas. Analysis shall include recommendation for fertilizer specific to the soil chemistry of the existing soil.

1.4 QUALITY ASSURANCE

A. Sod shall be grown by certified Florida State Plant Board Sod Farm or as approved by the Owner's Representative. The Owner's Representative shall inspect sod at the growing site prior to cutting and delivery to the site.

B. The Owner's Representative shall have the right at any stage of the construction to reject any and all work and materials, which in his opinion do not meet the requirements of these specifications. Such rejected work and materials shall be immediately removed from the site and replaced in an acceptable manner.

PART 2 - PRODUCTS

2.1 SOD

A. Grass species for the site: Paspalum notatum, Argentine Bahia grass, sand grown.

B. Grass species for the playing fields: Certified Tifway 419 Bermuda grass, sand grown.

C. Provide sod taken up in rectangles, preferably 16 inch by 24 inch, or rolls for Tifway 419, a minimum of 2 inches in thickness excluding growth and thatch, well matted with grass roots, and live, fresh, sand grown specifically for landscape and sports field use and uninjured at the time of planting. Before being cut and lifted the sod shall have been mowed three times with the final mowing not more than a week before cutting.

D. American Sod Producers Association (ASPA) Grade: Nursery Grown or Approved. Field grown (pasture) sod is not acceptable. Florida Turf Producer Association: Florida Standard Grade.

E. Sod shall be certified to meet Florida State Plant Board specifications, absolutely true to varietal type and free from weeds or other objectionable vegetation, fungus, insects and disease of any kind.

F. Time delivery so sod will arrive at site within twenty-four hours after being stripped. Do not deliver more sod than can be installed within 24 hours. Owner's Representative reserves the right to reject sod in extended storage at the site.

G. Protect sod against drying and breaking. Maintain proper moisture conditions, prior to placing, to assure sod viability and to prevent soil falling off during handling.

2.2 SOIL CONDITIONERS

A. Fertilizer shall be complete and derived from organic sources and comply with the State and Federal fertilizer laws.

For the purpose of bidding, assume 8% nitrogen, 4% phosphorus and 8% potash by weight. At least 50% of the total nitrogen shall contain no less than 3% water-insoluble nitrogen.

At the Contractor's expense, samples of existing on-site soils will be submitted to a certified testing laboratory for analysis and recommendation for the proper fertilizer to attain optimum growth of the sod. The test findings, along with the recommendations for amending the specified fertilizer mix shall be reviewed and approved by the Owner prior to delivery and application at the job site.

At the Contractor's expense, fertilizer amendments shall be added in the amount and manner prescribed by the soil analysis test results. Fertilizer mixture shall be delivered to the site in original unopened standard size bags showing weight, analysis and name of manufacturer. Containers shall bear the manufacturer's guaranteed statement of analysis, or a certificate of compliance covering analysis shall be furnished to the Owner's Representative. Store fertilizer in a waterproof place and in a manner that it will be kept dry and it's effectiveness will not be impaired.

B. Superphosphate shall be composed of finely ground phosphate rock intended for agricultural purposes containing not less than 20% available phosphoric acid.

C. Lime: agricultural limestone containing a minimum 80% calcium carbonate, 99% passing through No. 8 sieve and a minimum 75% passing through No. 60 sieve.

D. Sulfur: granular, biodegradable, containing a minimum of 90% sulfur, agricultural grade.

2.3 WATER FOR GRASSING

A. Obtain from any approved pond, lake, stream, or municipal water system.

B. Free of excess and harmful chemicals, acids, alkalis, or any substance, which might be harmful to plant growth or of obnoxious odor. Do not use salt water.

PART 3 - EXECUTION

3.1 LAWN BED PREPARATION

A. Remove all grasses, weeds and debris and verify with the Owner's Representative that grading operations have been completed and that final grades have been set. When removing weeds remove entire plant, including roots.

B. Scarify or loosen the area over which the sod is to be placed to a depth of approximately 4-6 inches and then rake smooth to eliminate surface irregularities. Remove rocks, stones, and other debris.

C. Spread superphosphate and fertilizer evenly over the area to receive sod. For bidding purposes apply superphosphate at rate of 5 pounds per 1000 square feet and complete fertilizer at rate of 16 pounds per 1000 square feet. Incorporate into soil to a depth of 6 inches.

D. Fine grade and moisten all areas to be sodded immediately prior to placement of sod. Do not interrupt establish drainage flow patterns.

E. Grade 1-½" to 2" below adjacent walks, curbs and pavement to allow for the thickness of sod resulting in a flush condition of soil to paved surface after placement of sod.

F. The surface shall conform with finish grade, less the thickness of the sod, free of water-retaining depressions, with the soil friable and of uniformly firm texture.

3.2 INSTALLATION

A. Place sod on prepared surface with edges in close contact. Firmly and smoothly embed by light tamping with appropriate tools. Roll surface when conditions warrant.

B. On playing fields install sod so that there is a seamless interface with no more than ½" gap between pieces, drum roll to assure soil/root contact. Remove all of the net backing from rolled sod. Top-dress seams and water.

C. Stagger setting of the pieces in drainage swales and on slopes to avoid a continuous seam along the line of flow.

D. Prevent the sod from sliding on steep slopes of 1:3 or greater by means of wooden pegs driven through the sod into firm earth at suitable intervals.

E. Remove and replace any pieces of sod that show dryness or poor color.

F. Cut sod with a sharp tool to conform to walks, planting bed, header boards and other features. Do not allow gaps and laps and noticeable irregularities or unevenness of surface grade. Sod used to fill irregular spaces shall be of a size at least one-half piece of sod.

G. Finish grade of all sod areas shall not be higher than adjacent paving, curbs, yard boxes, drains or other on-grade elements.

3.3 WATERING

A. Provide sufficient moisture for optimum results to areas on which the sod is to be placed.

B. Keep in a moist condition to the full depth of the rooting zone for at least 2 weeks after placing sod.

C. Apply water as needed for a minimum of 30 days and until established as determined by the Owner's Representative. Supplement irrigation system as needed.

3.4 MAINTENANCE

A. Maintain the site sodded areas in a satisfactory condition to produce a dense, well-established lawn. Maintenance shall include repairing of any damaged areas, areas of inconsistent grade and replacing areas in which the establishment of the grass stand does not appear to be developing satisfactorily.

B Mow newly sodded areas as soon as sod is rooted sufficiently to permit mowing. Mow periodically as directed. Maintain height typical for species. Do not remove more than one-half height at a single mowing.

C. Maintain playing field turf cutting height at 1", mow the first time in 3 – 4 weeks when sod is rooted. Apply ¼" top dressing sand after 30 days of growth. Surface of turf at the completion of the work shall be clean, true to grade and without irregularities.

D. Replanting or repair necessary due to the Contractor's negligence, carelessness, or failure to provide routine maintenance shall be at the Contractor's expense. Others shall pay for replanting necessary due to factors determined to be beyond the control of the Contractor.

3.5 ACCEPTANCE

A. For the purpose of establishing an Acceptance Standard, sod shall be healthy, well-rooted, evenly colored, viable, vigorous; free of weeds, disease and insects.

B. Substantial Completion and Final Acceptance shall be as stated in the General Conditions. Acceptance shall be no less than 30 days after substantial completion.

END OF SECTION 02930

Division 3
Concrete

SECTION 03100
CONCRETE FORMWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, general provisions of Contract, including General and Supplemental Conditions and Division 1 Specifications Section, apply to this Section.

1.02 SUMMARY

A. This Section includes furnishing labor, equipment, materials and transportation to provide formwork for cast-in-place concrete.

B. Related Sections: The following sections contain requirements that related to this section.

1. Section 03200: - Concrete Reinforcement

2. Section 03600: - Grout

1.03 SUBMITTALS

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

1.04 QUALITY ASSURANCE

A. Standards: Unless otherwise indicated, all materials, workmanship and practices shall conform to the following standards:

1. Standard Building Code.

2. ACI 347 Recommended Practice for Concrete Formwork.

3. Responsibility: The Contractor shall be responsible for the design of the formwork and for safety in its construction, use and removal.

4. Tolerances: Formwork shall be constructed to insure that finished concrete surfaces will be in accordance with the tolerances listed in ACI 347. Camber shall be provided as necessary to compensate for anticipated defection in formwork and concrete due to weight and pressure of fresh concrete and other construction loads.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Forms:

1. Forms shall be of wood, steel or other approved materials, and as specified in this Section. The sheeting for all exposed surfaces shall be 5-ply plywood, unless otherwise specifically authorized. Forms of like character shall be used for similarly exposed surfaces in order to produce a uniform appearance. Forming for exposed exterior concrete from 1-foot below finished exterior grade to top of structure shall be carefully fabricated so as to provide a smooth finish without defects.

2. The type, size, shape, quality and strength of all materials of which the forms are made shall be subject to the approval of Owner. If it is his opinion that the interior surfaces of the forms are too irregular to produce the specified finish, they shall be lined with smooth dense, moisture resistant hardboard or other material of which he approves.

B. Plywood: Unless otherwise indicated, forms shall be PLYFORM, Class 1, BB-Exterior type, mill oiled and edge sealed. Thickness shall be as required to support concrete at the rate place, but not less than 3/4-inch.

C. Form Accessories: Form accessories shall be of a commercially manufactured type.

1. Form ties shall be so constructed that the ends, or end fasteners, can be removed without causing appreciable spalling at the faces of the concrete.

2. After ends, or end fasteners of form ties have been removed, the embedded portion of the ties shall terminate not less than 1 1/2-inches from the formed face of the concrete. Use embedded rods with integral waterstops and cones.

3. Wire ties and wood spreader will not be permitted.

D. Chamfer Strips: Chamfer strips shall be polyvinyl strips or other approved material designed to be nailed in the forms to provide a 3/4-inch chamfer at exposed edges of concrete members.

E. Form Release Agent: form release agent shall be a paraffin base oil or mineral oil coating that will effectively prevent absorption of moisture and prevent bond with concrete, will not stain the concrete surfaces, and will leave the concrete with a paintable surface.

PART 3 - EXECUTION

3.01 INSTALLATION/ERECTION

A. Forms

1. Construction:

a. Forms shall be built true to line and grade, and shall be mortartight and sufficiently rigid to prevent displacement or sagging between supports. Particular attention shall be given to adequacy of supports and shoring, which is the Contractor's responsibility. The surfaces of forms used for permanently exposed surfaces shall be smooth and free from irregularities, dents, sags or holes. Forms for surfaces to receive stucco finish shall be suitable for its application.

b. All forms shall be so constructed that they can be removed without hammering or prying against the concrete. Unless otherwise indicated, suitable moldings shall be placed to bevel or round exposed edges at expansion joints or at any other corners that are to remain. Beams below grade shall have forms at both sides.

c. Bolts and rods used for internal ties shall be so arrange that, when the forms are removed, all metal is a least 1-1/2 inch from any concrete surface. Form ties shall be removed immediately after removal of forms, and holes shall be thoroughly plugged with grout within 24 hours after form removal and kept damp for 4 days to prevent shrinking.

d. Wire ties will not be permitted.

2. Form facing Materials: The facing material shall produce a hard form texture on the concrete. Facing materials with raised grain, torn surfaces, worn edges, patches, dents or other defects shall not be used. The maximum deflection of facing materials as reflected in concrete surfaces shall not exceed 1/240 of the span between structural members.

3. Preparation of Form Surfaces: After each use and prior to placing reinforcing, forms shall be cleaned of mortar, grout and other foreign material and the form release agent shall be applied. Form releasing agent shall not be allowed to stand in puddles in the forms or allowed to come in contact with hardened concrete against which fresh concrete is to be place.

4. Coating: Prior to the placing of steel reinforcement or concrete, forms for exposed surfaces shall be coated with a non-staining paraffin base oil or mineral oil. Forms for unexposed surfaces may be thoroughly wetted in lieu of oiling, immediately before the placing of concrete.

B. Adjustment: Positive means of adjustment of shores and struts shall be provided and all settlement shall be taken up during concrete placing.

C. Temporary Openings: Temporary openings shall be provided in wall forms to limit the free fall of concrete to a maximum of 4 feet unless an elephant trunk is used. such

openings shall be located to facilitate placing and consolidation and shall be spaced no more than 8 feet apart. Temporary openings shall also be provided in the bottom of wall and column forms and elsewhere as necessary to facilitate cleaning and observation immediately prior to placing.

D. Construction Joints: At construction joints, the contact surfaces of the form sheathing shall overlap the hardened concrete by not less than 1 inch. Forms shall be held against the hardened concrete to prevent offsets or loss of mortar.

E. Chamfers: All exposed concrete edges shall be chamfered 3/4-inch by 3/4-inch, unless otherwise indicated on the Drawings.

F. Runways: Smooth and rigid runways shall be provided (if needed) for moving equipment and concrete. Runways shall be supported directly on formwork or on grade and in no case on reinforcing steel or bar supports.

G. Footings, Grade Seams and Slab Edges: Exterior faces of footings, grade beams, walls and slab edges shall be formed with plywood.

H. Embedded Item: Set anchor bolts and other embedded items accurately and hold securely in position in the forms until the concrete is placed and set. Check all special castings, channels, or other metal parts that are to be embedded in the concrete prior to and again after concreting. Check all nailing, blocks, plugs and strips necessary for the attachment of trim, finish and similar work prior to concreting.

I. Pipes and Wall Spools Cast in Concrete:

1. Install wall spools, wall flanges and wall anchors before placing concrete. Do not weld, tie or otherwise connect the wall spools to the reinforcing steel.

2. Support pipe and fabricated fittings to be encased in concrete on concrete piers or pedestals. Carry concrete supports to firm foundations so that no settlement will be possible during construction.

J. Form Removal: Formwork shall not be removed from any concrete until it has obtained a minimum of 3,000 psi compressive strength to support itself and any live loads it may be subjected to, and then only with the approval of Owner.

END OF SECTION

SECTION 03200
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes furnishing and transport of reinforcing steel and welded wire mesh for cast-in-place or precast concrete structures.

B. Related Sections: The following sections contain requirements that related to this section.

1. Section 02650 – Water Distribution System

2. Section 02710 – Sidewalks

3. Section 02720 – Storm Drainage System

4. Section 02730 – Sanitary Sewerage System

1.03 QUALITY ASSURANCE

A. Standards: Unless otherwise indicated, all materials, workmanship and practices shall meet all requirements of the latest editions of the following standards:

1. Southern Standard Building Code.

2. ACI 318 Building Code Requirements for Reinforced Concrete.

3. ACI 315 Details and Detailing of Concrete Reinforcement.

4. CRSI Manual of Standard Practice, MSP-2.

1.04 SUBMITTALS

A. Submit complete shop drawings including bar lists and placing drawings to Owner for review in accordance with general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification. Drawings shall show the type, spacing and location of metal bar supports, the grade of the reinforcing and the name of the manufacturer. The type of coupler splice devices shall be designated.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reinforcing Steel:

1. Reinforcing steel shall conform to the requirements of ASTM Designation A 615, Deformed Grade 60, except where otherwise indicated.

a. The name of the manufacturer of the reinforcing steel shall be called out in the shop drawings together with a sketch showing the pattern of the deformation, including the mill mark.

b. Bar reinforcement shall be accurately fabricated in accordance with the latest CRSI Manual of Standard Practice. The Contractor shall have prepared and shall submit to Owner six (6) copies of necessary shop drawings and bar lists. The Contractor shall be responsible for errors made in shop drawings even though approved by Owner.

B. Welded wire fabric for concrete reinforcement shall conform to the requirements of ASTM Designation A 185 and shall be formed with smooth cold-drawn wire.

C. Supports:

1. Metal Bar Supports:

a. Bar supports for reinforcing steel shall conform to the requirements of CRSI Manual of Standard Practice, Chapter 3 and shall be of a height to furnish the concrete cover called for on Drawings. High chairs shall be furnished for bent or top bars in solid slabs. Bar supports to be in contact with exterior surfaces of concrete shall be Class C with plastic caps at least 1-inch in length on the leg tips, or Class E with stainless steel legs. Bar supports shall be spaced not more than 100 times the diameter of the bars to be supported, with not more than 1/4 spacing from the end of the supported bars to the firs chair.

b. Bar supports for slabs on grade shall be plain concrete blocks, 3-inches high by 4-inches square with the tie wires embedded in support. Concrete strength shall be at 3,000 psi at time of use.

2. Cold-drawn wire for spirals shall be plain and shall conform to the requirements of ASTM Designation A 82 with a minimum yield strength of 70,000 psi.

2.02 FABRICATION

A. Fabrication shall not begin until the approval of the shop drawings by Owner has been received. Fabrication shall meet all requirements of the specified standards. Unless otherwise indicated the following shall apply:

1. Hooks shall be standard hooks.

2. Bottom bars shall extend a minimum of 6 inches into supporting members.

3. Cover is to the outermost stirrup, tie or bar.

4. Splices are permitted only where indicted on the Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Reinforcing Steel: When placed in the forms, reinforcement shall be clean and free of all rust, scale, dust, dirt, paint, oil or other foreign material and shall be accurately and securely positioned in the forms as shown on the Drawings before the placing of concrete. Reinforcing steel shall be wired or otherwise fastened together at intersections and shall be supported by concrete or metal supports, spacers or hangers. Bar supports, where adjacent to the ground, shall be set on precast concrete pads compressed into the subgrade. The Contractor shall obtain Owner's approval before fastening reinforcing steel at intersections by welding methods.

1. Splicing of reinforcement shall be held to a minimum and shall be placed at points of minimum stress. Bars shall be lapped at splices a minimum of 24 bar diameters unless otherwise shown on the Drawings or directed by Owner, and shall be rigidly wired or clamped.

2. Wire fabric shall be straitened before placing and shall overlap one full space of mesh at ends and edges and shall be securely fastened. Fabric shall be supported so as to occupy its proper location in the concrete as shown on the Drawings. Fabric shall not cross any expansion joints.

B. Embedded Items: In addition to steel reinforcement, pipes, inserts and other metal objects as shown, specified or ordered shall be built into, set in or attached to the concrete. All necessary precautions shall be taken to prevent these objects from being displaced, broken or deformed. Before concrete is placed, care shall be taken to determine that all embedded parts are firmly and securely fastened in place as indicated. They shall be thoroughly clean and free from paint or other coating, rust, scale, oil, or any foreign matter. No wood shall be embedded in concrete. The concrete shall be packed tightly around pipes and other metal work to prevent leakage and to secure perfect adhesion. Drains shall be adequately protect from intrusion of concrete.

C. Supporting Reinforcing: Bar supports shall be provided as required by CRSI MSP-2 and ACI-315. Top and bottom bars in slabs formed on earth shall be supported on precast concrete block supports except where such bars are properly supported from formwork. Precast concrete block supports are not required in slabs formed on tremie concrete but may be used at the Contractor's option.

D. Placing Reinforcing: Placing of reinforcing and welded wire fabric shall be as indicated on the Drawings and as recommended by CRSI MSP-2 and ACI 315. Reinforcing shall be securely tied and supported to prevent displacement during concrete placement.

E. Welded Wire Fabric: Splices in welded wire fabric shall be such that the overlap

between the outermost cross wires of each fabric sheet is not less than the spacing of the cross wires, plus 2 inches. Fabric shall not be extended through expansion joints or construction joints in slabs on grade, except as otherwise noted.

F. Dowels: Dowels shall be wired in position prior to placing concrete.

G. Field Bending: Heat shall not be used to bend bars. Bars shall not be bent after being embedded in concrete.

H. Welding: Welding of reinforcing will not be permitted.

I. Place reinforcement a minimum of 2 inches clear of any metal pipe or fittings.

END OF SECTION

SECTION 03400
PRECAST CONCRETE STRUCTURES

PART 1 -GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes furnishing and installing complete precast concrete structures as shown on Drawings for storm drainage system and/or sanitary sewerage system and appurtenances.

B. Related Sections: The following sections contain requirements that related to this section.

1. Section 02220 - Excavating, Backfilling, and Compacting

2. Section 02720 - Storm Drainage System

3. Section 02730 – Sanitary Sewerage System

1.03 SUBMITTALS

A. Shop Drawings: Submit in accordance with general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections shop drawings and manufacturer's data sheet for proposed precast concrete structures. Units which are not manufactured in strict compliance with the approved Shop Drawings and these Specifications will be rejected.

PART 2 - PRODUCTS

2.01 MATERIALS AND FABRICATION

A. Precast units shall conform to the requirements of ASTM Designation C478, Precast Reinforced Concrete Manhole Sections, with reinforcement of Grade 60 bars and the following modifications thereto:

1. The minimum wall thickness shall be as indicated on the Drawings.

2. Placing and setting of the reinforcing steel shall be inspected at the casting yard prior to pouring of concrete.

3. Cement shall be Type II.

4. Joints shall be compression type, neoprene gasket joint of a design approved by Owner. A preformed plastic joint filler shall be used in filling the remainder of the joint.

5. Lifting holes through the structures are not permitted.

6. The reinforced concrete bottom slab shall be as shown on Drawings, The bottom slab for manholes shall be cast monolithically with the lower wall section and the longitudinal cylindrical reinforcement shall extend into the slab wall reinforcement shall be as shown on Drawings or as otherwise approved by Owner.

B. Grout: See Section 3600 - Grout

PART 3 - EXECUTION

3.01 INSTALLATION

A. The precast structures shall be set level with the walls plumb on the graded crushed rock bedding as specified in Section 02220 – Excavating, Backfilling and Compacting..

B. Coatings shall be as specified on the Drawings, if required.

C. Backfill around structures shall consist of clean sand, install in 8-inch layers and thoroughly compacted.

END OF SECTION

SECTION 03600
GROUT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. The work included under this section consists of furnishing all materials, forms, transportation and equipment, and performing all necessary labor to do all the pointing and patching of reinforced concrete paving and concrete sitework as shown on Drawings, or incidental to the proper execution of the work, or as herein specified.

B. Related Sections: The following sections contain requirements that related to this section.

1. Section 02650 – Water Distribution System

2. Section 02710 – Sidewalks

3. Section 02720 – Storm Drainage System

4. Section 02730 – Sanitary Sewerage System

1.03 SUBMITTALS

A. Submit to the Owner in accordance with general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections.

1. Grout design mix for Class A and Class B concrete

PART 2 - PRODUCTS

2.01 GENERAL

A. Composition: Grout for pointing and patching shall consist of cement and fine aggregate mixed in the proportions used in the concrete and a minimum amount of water to produce a plastic workable grout mixture in accordance with all requirements under this section suitable to the specific conditions of placement.

B. Non-shrink Grout: Non-shrink grout shall be nonmetallic, pre-mixed type and shall be Sauereisen F-100 Level Fill, Master Builders Masterflow 713, Burke Non-Ferrous, Non-Shrink Grout or approved equal.

PART 3 - EXECUTION

3.01 PREPARATION

A. Grout Mixing:

1. Grout shall be mixed by hand.

2. Measurement: All materials, cement and fine aggregate, shall be measured by weight, except that water may be measured by volume.

3.02 INSTALLATION

A. The grout shall be as thick as possible on vertical surfaces and at least 1/2-inch thick on horizontal surfaces.

B. All voids produced by spacers or any honeycombing shall be pointed up with grout and troweled flush with the concrete surface immediately after removal of forms and water cured to prevent shrinkage.

C. The use of grout pointing or patching shall be confined to the repair of small defects in relatively green concrete.

END OF SECTION

SECTION 03900
SECTION 1

SKATEPARK SPECIALIST CONSTRUCTION SUMMARY OF SCOPE

SECTION 1 - SUMMARY OF SCOPE

These specifications present the skatepark specialist's scope of construction. The skatepark specialist's scope of services is summarized in the list below. A summary of the General Contractor's scope of services is also summarized. The application, forming, reinforcing, cutting, sculpting and finish work of all concrete inside the skatepark area is a sole source specialty construction work item within the contract documents. Coping and rail fabrication is also a sole source specialty construction work item within the contract documents.

1.10 - SKATEPARK SPECIALIST'S SCOPE OF SERVICES

- Provide labor for specialty crew to execute the following:
  - Layout and stake out perimeter of entire skate area
  - Produce master transition templates
  - Set forms for entire skate area
  - Fine grade and compact entire skate area
  - Install and weld metal coping/railings for entire skate area
  - Rebar placement of entire skate area
  - Pour shotcrete & concrete for entire skate area
  - Finish all concrete to a smooth steel trowel finish for entire skate area
  - Apply curing sealer to entire skate area
  - Saw cut joints in skate area
  - Attach drain fixtures to existing drain lines in skate area
  - Remove forms & clean up
  - Apply caulking & joint fillers for entire skate area

- Provide entire material package for the entire skate area
- Provide all skating accessories for the entire skate area
- Provide all tools
- Provide entire machinery package
- Provide job site storage
- Provide refuse dumpster
- Provide portable restroom, if necessary
- Provide temporary fencing around working perimeter, if necessary

1.12 - OUTSIDE SERVICES PROVIDED BY SKATEPARK SPECIALIST

- Provide concrete testing (per 50 yards)
- Provide concrete pumping services

1.20 - GENERAL CONTRACTOR'S SCOPE OF SERVICES

This outline summarizes the general contractor's scope of work necessary to prepare the site for the skatepark specialist. The scope listed is only relevant to the immediate skatepark area only.

- Obtain all permits
- Provide temporary power/water to site & storage facility

- Provide erosion control for job site
- Provide site surveying, elevations and grade stakes for entire skate park
- Provide clearing, grubbing, rough grading and excavation of entire skate park
- Provide soil remediation, if necessary
- Provide sub-base, fine grading and course aggregate base
- Backfill (import/export as required)and compact subgrade (per specs)
- Provide soil borings/compaction testing (provide copies to skatepark)
- Provide/Install all drain lines into the skatepark
- Install rebar and forms, pour and finish concrete for all retaining walls, planters, curbing, footers, and turndowns outside of the immediate skatepark surface
- Install any amenities outside of the skate park
- Provide storm water engineering and work, if applicable
- Install sod

SECTION 03900
SECTION 2

SPECIALTY SKATEPARK CONSTRUCTION SPECIFICATIONS

2.1 – CONCRETE FORMWORK

PART 1 – GENERAL

The application, forming, reinforcing, cutting, sculpting and finish work of all concrete inside the skatepark area is a sole source specialty construction work item within the contract documents.

2.100 – DESCRIPTION

Provide formwork and accessories for construction of cast in place concrete work.

2.101 – RELATED WORK

- 2.2 – CONCRETE REINFORCEMENT
- 2.3 – CAST-IN-PLACE CONCRETE/SHOTCRETE
- 2.4 – CURING & SEALING
- 2.5 – COPING AND RAIL FABRICATION

2.102 –STORAGE OF MATERIALS

Store materials on and under protective sheeting.

2.103 –COORDINATION

Notify responsible trades of schedules of concrete pours to allow time for installation and coordination.

PART 2 – PRODUCTS

2.104 –MATERIALS

A. Flatwork, Vertical and Custom work- Exterior grade standard plywood, Minimum three ply, one smooth side sufficiently thick to sustain loads, or steel forms.
B. Forms Form Oil: Non Staining, Paraffin-base oil intended for coating forms.
C. Form Ties: Bolts, rods or patented devises having tensile strength of 3000lbs., adjustable length, free of lugs which would leave a hole larger than 5/8” diameter and having a full one inch depth of break-back.

PART 3 – EXECUTION

2.105 –CONSTRUCTION AND ERECTION

A. Build forms to shapes, lines and dimensions of detailed components of concrete construction. Set to line and grade, brace and secure to withstand placing of concrete and maintain their shape and position.
B. Construct forms with care to produce concrete surfaces without unsightly or objectionable form marks in exposed concrete.
C. Thoroughly clean surfaces of materials and remove nails before reuse. Do not reuse damaged or worn forms. Use non-staining Form Oil (if required) prior to placing metal reinforcement.
D. Immediately before placing concrete, clean forms of chips, sawdust and debris. Immediately after removal of forms, remove form ties, wires and defects and patch.

2.106 –INSERTS AND ACCESSORIES

Make provisions for required installation for accessories, bolts, hangers, sleeves, anchor slots and inserts cast in concrete. Obtain suitable templates or instructions for installation of items. Place expansion joints where details indicate.

2.107 –REMOVAL OF FORMS AND SHORING

Remove forms and shoring after proper curing time

2.108 –CLEANUP

Remove Debris and trash

2.2 – CONCRETE REINFORCEMENT

PART 1 – GENERAL

The application, forming, reinforcing, cutting, sculpting and finish work of all concrete inside the skatepark area is a sole source specialty construction work item within the contract documents.

2.200 – DESCRIPTION

Provide steel reinforcement for all cast in place concrete and shotcrete inside the skatepark.

2.201 – RELATED WORK

- 2.1 – CONCRETE FORMWORK
- 2.3 – CAST-IN-PLACE CONCRETE/SHOTCRETE
- 2.4 – CURING & SEALING
- 2.5 – COPING AND RAIL FABRICATION

2.202 – DELIVERY AND STORAGE

Stack all reinforcing steel in tiers. Reinforcements that differ in gauge and size must be separated and labeled. Maintain reinforcement free of dirt, mud, paint or rust.

2.204 – SUBMITTALS

Indicate materials being used, and complete reinforcing method for each concrete member, including materials, sizes, bends, dimensions, stirrup spacing and placing details not shown on drawings.

PART 2 – PRODUCTS

2.205 – MATERIALS

A. Steel reinforcement (rebar): Standard Deformed steel bar, 3/8” (#3), 1/2” (#4), 5/8” (#5), Grade 60
B. Welded steel reinforcement: Deformed Low alloy steel, carbon content not exceeding 0.30% and manganese content no exceeding 0.60%. Identify and tag with manufacturer’s heat identification number.

2.206 – FABRICATION

Fabricate rebar to sizes, shapes and lengths detailed in plan,

PART 3 – EXECUTION

2.207 – INSTALLATION

A. Accurately place reinforcing steel in accordance with drawings. Thoroughly clean reinforcement of any coating which would reduce bonding. Do not heat, cut, or bend bars without the Engineer's approval. Do not splice reinforcement at points of maximum stress. Stagger splices in adjacent bars and provide a minimum overlap of 30-bar diameters at splices unless specifically noted otherwise on drawings.
B. Securely saddle tie intersections with No. 18 ga. Black annealed wire. Rigidly secure reinforcement in place. Provide concrete coverage as shown on drawings.

2.208 – WELDING REINFORCEMENT

A. Weld deformed steel reinforcement bars using recommended pre-heat temperature and electrode for type of steel being welded.
B. Do not weld steel reinforcement bars without proper heat identification.

2.209 – CLEANUP

Remove all debris and trash resulting from specified work.

2.3 – CAST IN PLACE CONCRETE/SHOTCRETE

The application, forming, reinforcing, cutting, sculpting and finish work of all concrete inside the skatepark area is a sole source specialty construction work item within the contract documents.

PART 1 – GENERAL

2.300 – DESCRIPTION

Provide cast in place concrete and Shotcrete for all skatepark area's designated in the construction documents. Refer to drawings for specific locations of cast in place concrete and shotcrete.

2.301 – RELATED WORK

- 2.1 – CONCRETE FORMWORK
- 2.2 – CONCRETE REINFORCEMENT
- 2.4 – CURING & SEALING
- 2.5 – COPING AND RAIL FABRICATION

2.302 – SUBMITTALS

A. The Concrete mixes shall be designed in accordance with industry standards to account for temperature, humidity, required strength, and curing time.
B. Check mix design and revise, if necessary, whenever changes are made in aggregate or in surface water content of aggregate or workability of concrete. Slump shall be the minimum to produce a workable mix.

C. Forward two copies of design mix to owner's Engineer for approval.

2.303 – COORDINATION

Notify responsible trades of schedules of concrete pours so as to allow adequate time for installation of work and inspection prior to pour. Obtain all materials and other miscellaneous steel items to be cast into concrete. Verify all measurements and layout to avoid any delay.

2.305 –JOB CONDITIONS

A. Environmental conditions: Monitor wind velocity, relative humidity, temperature and concrete temperature in order to maintain specified maximum rate of evaporation.
B. Coordination:
    1. Coordinate schedules of concrete pours to allow adequate time for installation of other related work.
    2. Verify the placement of all steel items to be cast into concrete are properly placed.
    3. Coordinate size and location of mechanical and electrical equipment concrete pads.
    4. Coordinate earthwork and soils report requirements with placement requirements.
    5. Coordinate with form-work and finishes sections to provide finish floor levelness and flatness as specified herein. Slope to drains at grades and percent slope shown on contract documents.

2.306 – DELIVERY, STORAGE AND HANDLING

A. Properly deliver and handle materials to prevent contamination, segregation or damage to materials
B. Store cement in weather tight enclosures to protect against dampness and contamination.
C. Prevent segregation and contamination of aggregates by proper arrangements and use of stockpiles.
D. Store admixtures properly to prevent contamination, evaporation or other damage.

2.307 –QUALITY ASSURANCE

A. Use independent party to conduct concrete density tests
B. Test concrete as work progresses at 50 yard increments
C. Coordinate with testing company to provide results to owner's Engineer.

2.308 - SUBMITTALS

A. Manufacturer's data: Current printed specifications with application and installation instruction for proprietary materials including concrete admixtures
B. Mix Design: Concrete Mix Proportions
C. Maintenance: Provide a Maintenance plan
D. Warrantee: Provide a minimum of one year warrantee covering work deficiencies

PART 2 – PRODUCTS

2.309 – MATERIALS

A. Portland cement: Meets ASTM C150, Type 1 or 2, one brand only from qualified local supplier
B. Fly ash: Meets ASTM C618 from qualified local supplier.
C. Fine aggregate: Clean, hard, durable, uncoated natural silica-based sand, free from silt, loam or clay
D. Coarse aggregate: Clean hard durable, un-coated crushed limestone, crushed concrete, or granite. Unless otherwise noted in aggregate size 3/8" maximum, No. 5, 56 or 57. Base rock shall conform to local code.
E. Water: Fresh, clean, potable and free of deleterious acids, mixing and curing water, as available from owner. Transport as required.
F. Admixtures: Use only accepted admixtures meeting the following requirements:
    1. Chemical Admixtures: Meets ASTM C494/C494M
    2. Water reducing, retarding or acceleration admixtures shall conform to ASTM C494.
    3. Air entraining Admixtures: Meets ASTM C260. Air entraining prior to shooting shall be 1.5%-3%
    4. The use of calcium chloride shall not be permitted. The contractor shall submit details of proposed admixtures with the concrete mix design.

2.310 – PROPORTIONS AND MIXING

A. Portland cement: 600 lbs minimum per 27 cubic foot design.
B. Fly ash: Maximum 20% by weight of the combined total weight of the cement and fly ash.
C. Compression strength: 4000 P.S.I.
D. Slump: 4 inch
E. Admixture: No admixtures without approval. Introduce admixtures in quantities and according to methods recommended my admixture manufacturer.
F. Mixing: Ready mixed concrete from certified local supplier. Do not transport or use concrete after 1-1/2 hours have elapsed from time of initial mixing. Supplier of transit-mixed concrete shall have a plant of sufficient capacity and adequate transportation facilities to assure continuous delivery at required rate, to provide continuous concrete placement throughout a pour.
G. Grout and dry pack: non shrink, non metallic: U.S. Grout Corp. "Five Star Grout" , 5,000PSI, or approved equivalent.
H. Review: Mix Design shall be reviewed for acceptance by owner's Engineer.

2.311 – WET MIX SHOTCRETE CONCRETE APPLICATION EQUIPMENT

A. Mixing equipment: Capable of thoroughly mixing aggregate, cement and water in sufficient quantity to maintain continuous placement.
B. Ready Mixed Concrete: May be delivered to the site in the dry state if the equipment is capable of adding the water and mixing it satisfactorily with the dry ingredients.
C. Air Supply: Clean air adequate for maintaining sufficient nozzle velocity for parts of work and for simultaneous operation of blow pipe for cleaning away rebound.
D. Delivery equipment: Capable of discharging aggregate cement water mixture accurately, uniformly and continuously though delivery hose.

2.312 - CURING MATERIALS

A. Water: Domestic quality, clear and potable with no chemical content.
B. Sheet material: Color, white.
C. Curing compound/sealer: Evercrete DPS or equal.

2.313 –MIXES

Do not retemper mix by adding water in field

PART 3 – EXECUTION

2.314 –INSPECTION

A. Examination: Examine concrete formwork and verify that it is true to line and dimension, adequately braced against vibration and constructed to permit escape of air and rebound but to prevent leakage during shotcreting. Correct deficiencies.
B. Inspection: Inspect reinforcement steel and items to be embedded in concrete. Correct any deviations from the accepted shop drawings.
C. Notification: Notify any other trades involved in ample time to permit the proper installation of their work. Cooperate in setting such work.
D. Existing surfaces: Examine existing concrete surfaces for unsound material. Correct deficiencies.

2.315- CONCRETE BATCHING AND MIXING

Proportions: Mix proportions shall be controlled by weight batching. Contractor's testing laboratory shall maintain quality control records during shotcrete production and make those records available to Owner's Engineer.

2.316- CONCRETE PLACEMENT

A. Placement: Use suitable delivery equipment and procedures that will result in shotcrete in place meeting the requirements of this specification. Determine operating procedures for placement in, extended distances, and around any obstructions where placement velocities and mix consistency must be adjusted.
B. Placement techniques: Do not place shotcrete if drying or stiffening of the mix takes place at any time prior to delivery to nozzle.
    1. Control thickness, method of support, air pressure, and or water content of shotcrete to preclude sagging or sloughing off. Discontinue shotcreting or provide suitable means to screen the nozzle stream if wind or air currents cause separations of the nozzle stream during placement.
    2. Hold nozzle as perpendicular to surface as work will permit, to secure maximum compaction with minimum rebound.
    3. In shotcreting walls, begin application at the bottom. Ensure work does not sag.
    4. Layering:
        a. Build up layers by making several passes of nozzle over work area.
        b. Broom or scarify the surface of freshly placed shotcrete to which, after hardening, additional layers of shotcrete are to be bonded. Dampen surface just prior to application of succeeding layers.
        c. Allow each layer of shotcrete to take initial set before applying succeeding layers.

d. Use radial templates to insure exact radii form flat bottom of skatepark to face coping. Template shall be fabricated from steel or ¾" plywood. Check every horizontal foot when applying shotcrete for conformance of intended wall radii. Brace template and place levels at arc to tangent connections to insure no kinks will be formed. Kinks at the bottom of bowls will not be acceptable. Slumping of the shotcrete causing coping setback will not be acceptable.

5. Placement around reinforcement:
   e. Hold nozzle at such distance and angle to place materials behind reinforcement before any material is allowed to accumulate on its face. In the dry-mix process, additional water may be added to the mix when encasing reinforcement to facilitate a smooth flow of materials behind the bars.
   f. Test to ascertain of any void or sand pockets have developed around or behind reinforcement by probing with an awl or other pointed tool after the shotcrete has achieved its initial set, by removal of randomly selected bars, or coring or other suitable standards.

C. Access: Allow easy access to shotcrete surfaces for screeding and finishing, to permit uninterrupted application.

2.317- REMOVAL OF SURFACE DEFECTS IN CONCRETE

A. General: remove and replace shotcrete which lacks uniformity, exhibits segregation honeycombing or lamination or which contains any dry patches, slugs, voids or pockets. Remove defective areas.
B. Sound work with hammer for voids. Remove and replace damaged in-place shotcrete.

2.318- CONCRETE FINISH

A. Finish-General: Smooth form finish consists of a smooth, hard, uniform texture with a minimum of seams.
B. Radial/Banked Wall finish: Float finish on radial banked face of wall shall consist of a smooth, hard, uniform surface of smooth steel trowel. Level to a tolerance of ¼ inch in 10 feet when tested with a 10 foot steel straight edge placed on the surface horizontally and vertically with radial/bank template with the appropriate radii/angle. Grinding the surfaces will not be an acceptable means of achieving the intended radii/angle.

2.319- CONCRETE JOINTS

A. Cleaning: The entire joint shall be thoroughly cleaned and wetted prior to the application of additional shotcrete.
B. Reinforcement: Make joints perpendicular to the main reinforcement. Continue reinforcement across joints.

2.320 –CLEANUP

A. Efflorescence: Remove efflorescence as soon as it appears.
B. Use the least aggressive cleaning techniques possible.
C. Wear protective eye wear, gloves and clothing suitable to work and as required by cleaner manufacturer.

D. If proprietary cleaning agents are used, pre wet wall, test cleaning agent on a small inconspicuous area and check effects prior to proceeding. Begin cleaning at the top and work down. Thoroughly rinse wall afterwards with clean water. Follow cleaner manufacturer's instructions.
E. Cleanup all debris, excess concrete and miscellaneous material associated with work.

2.321 –TOLERANCES

Minor variances in color and appearance of concrete are acceptable.

2.4 – CURING & SEALING

The application, forming, reinforcing, cutting, sculpting and finish work of all concrete inside the skatepark area is a sole source specialty construction work item within the contract documents.

PART 1 – GENERAL

2.400 – DESCRIPTION

Provide curing/sealer material for cast in place flatwork and shotcrete walls (radial and angled).

2.401 – RELATED WORK

- 2.1 – CONCRETE FORMWORK
- 2.2 – CONCRETE REINFORCEMENT
- 2.3 – CAST-IN-PLACE CONCRETE/SHOTCRETE
- 2.5 – COPING AND RAIL FABRICATION

2.402 – SUBMITTALS

Submit detailed technical data of products proposed for curing use for owner's representative for approval.

2.403 – DELIVERY AND STORAGE

Deliver materials in original sealed containers with seals and labels intact. Use materials out of original containers only and store in a dry place.

PART 2 – PRODUCTS

2.404 – MATERIALS

A. CURING AGENT: EVERCRETE Deep Penetrating Sealer (or equal). Spray on cure agent. Apply immediately to final finished concrete. Use recommended amount per the manufacturer's specifications. If other material is used, submit product information to Owner's Engineer for approval prior to starting concrete work.

PART 3 – EXECUTION

2.405 – CURING

A. Protect concrete surfaces against rapid drying. Keep sealed with cure agent for necessary amount of time to reach concrete strength and inhibit moisture loss after placing per manufacturer's recommendation.

B. Curing Method: Spray entire surface immediately after final finish work. Protect surface from water, adjacent shotcrete work and debris.

2.405 – CLEANUP

Specialty Contractor is to remove all debris and trash resulting form specified work. Use power washing and soft brush not causing abrasion to finish work surface prior to final inspection.

2.5 – COPING AND RAIL FABRICATION

The application, forming, reinforcing, cutting, sculpting and finish work of all concrete inside the skatepark area is a sole source specialty construction work item within the contract documents. Coping and rail fabrication has been deemed as sole source specialty construction work within the contract documents.

PART 1 – GENERAL

2.500 – COPING AND RAIL FABRICATION

Coping and rail fabrication consisting of rolling to specified radii, cutting, piecing, sleeves, anchors, welding and setting to horizontal and vertical elevations.

2.502- RELATED WORK

- 2.1 – CONCRETE FORMWORK
- 2.2 – CONCRETE REINFORCEMENT
- 2.3 – CAST-IN-PLACE CONCRETE/SHOTCRETE
- 2.4 – CURING & SEALING

2.503 –VERIFICATION

A. Verify all measurements at the job. Show dimensions, sizes, and thicknesses, gauges, finishes, joining, attachments and relationship of work to adjoining construction. Where items must fit and coordinate with finished surfaces and/or constructed spaces, take measurements at the site and not from drawings.
B. Provide Owner with the name and address of coping supplier.

2.504 – DELIVERY STORAGE AND HANDLING

A. Storage of materials:
    a. Materials which are stored at the project site shall be above ground and on platforms, skids or other supports. Protect steel from corrosion. Store other materials in a weather tight and dry place until ready for use.
B. Protection:
    b. Use all means necessary to protect miscellaneous metals before during and after installation and to protect the installed work and materials of all other trades.
    c. Protect any adjacent materials or areas below from damage due to weld splatter or sparks during field welding
C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of owner's representative and at no additional cost to the owner.

2.505 – JOB CONDITIONS

A. Examine existing conditions in which work is to be installed. Notify owner's representative if conditions are unacceptable to begin work.
B. Do not proceed with the work until unsatisfactory conditions have been corrected.

2.506 – COORDINATION

A. Templates and Built-ins: Furnish all anchors, fastenings, sleeves, setting templates and layouts affecting or installed in the work of other trades.
B. Delivery: Where items must be incorporated or built into adjacent work, deliver to trade responsible for such work in sufficient time that progress of work is not delayed. Be responsible for proper location of such items.

PART 2 – PRODUCTS

2.507 – STEEL PIPE COPING (ASTM A500 GRADE B)

A. STEEL PIPE COPING
   - 2" ID round hot-dipped galvanized pipe
   - 2"x3" square tube hot-dipped galvanized
   - 2"x4" square tube hot-dipped galvanized
   - Penrose BRAND Pool Block
B. WELDING RODS: E series Low Hydrogen unless otherwise noted on drawings.
C. GROUT
   - U.S. Grout Corp. "Five Star Grout"
   - Non shrinking Master Builder's "Embedco"
   - Conrad Sovig's "Metel-MXS Grout"
   - Sonneborn's "Ferrolith G Redi-Mixed Grout"
   - Approved equal
D. OTHER MATERIALS: All other materials, not specifically described but required for a complete and proper installation of miscellaneous metals, shall be new, first quality of their respective kinds and subject to the approval of the owner's representative.

PART 3 – EXECUTION

2.508 – EXISTING CONDITIONS

A. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete and to the point where this installation may properly commence.
B. In the event of discrepancy, immediately notify the owner's representative.

2.509 – INSTALLATION

A. Install metal fabrication in strict accordance with the drawings, the approved shop drawings and all pertinent codes, regulations and standards.
B. Obtain Owner's Representatives review prior to making major changes that is not part of the scheduled work.
C. Install items square and level, accurately fitted and free from distortion or defects.
D. Align all metal fabrications as shown on the drawings, and where vertical or horizontal members are shown, align them straight, plumb and level within a tolerance of one in 500.

E. Make provisions for erection stresses by temporary bracing. Keep work in alignment.
F. Replace items damaged in course of installation.
G. After installation, grind and touch up field welds.
H. Apply galvanized spray over all field welds.

2.510 – WORKMANSHIP

A. Layout: Set all work plumb, true, rigid and neatly trimmed out. Miter Corners and angles of exposed molding and frames unless otherwise noted.
B. Fitting: Fit exposed connections accurately together to from tight hairline joints.
C. Labor: Employ Workmen Skilled in such work.

2.511 – FABRICATION

A. Shop assemble in largest practicable dimensions, making members true to length so assembling may be done with out fillers
B. Provide all surfaces free of file marks dents; hammer marks, wire edges or any unsightly surface defects.
C. STEEL PIPE COPING: Roll pipe to conform to the top radius curve of each bowl and ledge as shown on drawings.

2.512 – ATTACHMENTS AND REINFORCEMENTS

Do all cutting, shearing, drilling, punching, threading, tapping, etc., required for site metalwork or for attachment of adjacent work. If applicable drill or punch holes; do not use cutting torch.

2.513 – OTHER CONNECTORS

Make all permanent connections in ferrous metal surfaces using welds where at all possible: do not use bolts or screws.

2.514 – WELDING

A. Preparation: Remove all rust, paint, scale and other foreign matter. Wire brush all flame cut edges. Clamp members as required and alternate welds, all as necessary to prevent warping or miss alignment.
B. Exposed Welds: uniformly grind smooth (no tolerance) all welds normally exposed to view and feel in the finished work.
C. Faulty or defective welding: chip out and replace all welding showing cracks, slag inclusion, lack of fusion, bad undercut or other defects ascertained by visual or other means of inspection. Replace and re-weld at no cost to the owner.
D. Field welding:
    1. Procedure: Comply with AWS code manual shielded metal-arc welding, appearance and quality of welds made and methods used in correction welding work.
    2. Protection: Protect all adjacent surfaces from damage due to weld sparks spatter or tramp metal.

2.515 – SURFACE TREATMENT AND PROTECTIVE COATINGS

A. Cleaning:
    1. Thoroughly clean all mill scale, rust, dirt, grease and other foreign matter form ferrous metal prior to any galvanizing or painting.

2. Conditions in which are too severe to be removed by hand cleaning, shall be cleaned using appropriate methods for solvent cleaning, power tool cleaning and brush-off blast cleaning.

B. Exterior Ferrous Metal:
   1. Grind smooth all welds, burrs, and rough surfaces. Clean all coping from grease.
   2. Shop coat iron metal items; using anti-rust primer (red Color)
   3. All welds to be painted with primer after appropriate connections and grinding has taken place. Touch up all scratched primer prior to shotcrete application.

2.516 – CLEAN UP

A. Keep all areas of work clean, neat and orderly at all times. Keep paved areas clean during installation.
B. Clean up and remove all debris from the entire work area prior to final acceptance to satisfaction of owner's representative.

END OF SECTION

Division 12
Furnishings

SECTION 01293

SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDS

A. Furnish all labor, material, equipment, related services and supervision necessary for or incidental to the installation of the site furnishings as shown or indicated on the drawings and/or specified.

1.3 SUMMARY

A. This Section includes the following:

1. Bicycle racks.
2. Benches.
3. Picnic Tables
4. Trash Receptacles
5. Grills
6. Hose Bibs
7. Water Fountains
8. Playground 2-5 Years
9. Playground 5-12 Years
10. Swing
11. Picnic Pavilion

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Installation details.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel and Iron: Free of surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53, or electric-resistance-welded pipe complying with ASTM A 135.
3. Tubing: Cold-formed steel tubing complying with ASTM A 500.
4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500; zinc coated internally and externally.
5. Sheet: Commercial steel sheet complying with ASTM A 1011/A 1011M.

B. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial quality, tamperproof, vandal and theft resistant, concealed, recessed, and capped or plugged.

C. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107; recommended in writing by manufacturer, for exterior applications.

D. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:
1. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

2.2 FABRICATION

A. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

3.3 CLEANING

A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

END OF SECTION 01293

Division 15
Mechanical

SECTION 15420
DISINFECTION OF WATER LINE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMAMRY

A. This section includes furnishing all labor, equipment, materials and transport, required for the disinfection of all water lines, and the collection and testing of water samples for bacteriological analysis and regulatory approval. If necessary, this work shall be conducted in phases, with separate regulatory clearances for each phase of the work. Phasing of the work shall be done at no additional cost to Owner.

B. Related work: The following sections contain requirements that related to this Section

1. Section 02650 – Water Distribution System

C. All disinfection and bacteriological sampling and testing shall be in compliance with Rule 62-555 F.A.C. A letter of clearance must be issued by the applicable regulatory agencies prior to placing any temporary or permanent construction in service.

1.03 SUBMITTALS

A. Submit schedule of disinfection of water line in accordance with AWWA C651 "Disinfecting Water Mains".

PART 2 - MATERIALS

2.01 CHLORINE

A. Chlorine and water for flushing, testing and chlorination shall be furnished and paid by the Contractor.

B. Chlorine may be derived from chlorine gas, or 70 percent (high test) calcium hypochlorite (HTH or perchloron, or equal).

PART 3 - EXECUTION

3.01 FLUSHING

A. Flushing: Flush all water mains with water to remove all sand and other foreign matter. Dispose of the flushing water without causing a nuisance or property damage.

3.02 DISINFECTION

A. Before any portion of water distribution system is to placed in service, disinfect it in accordance with the requirements of AWWA C651 and demonstrate its disinfection by bacteriological test conducted in accordance with Standard Methods for Examination of Water and Wastewater, by an approved laboratory acceptable to Owner and the Florida Department of Environmental Protection.

B. Use free chlorine in aqueous solution as the disinfecting agent, with sustained concentration for 12 hours or more of not less than 50 parts per million. Administration may be by any of the several methods described in AWWA C651 as proposed by Contractor and approved by Owner. The method must be approved prior to commencement of the disinfection process.

3.03 SAMPLING

A. After disinfection has been completed, samples of water for bacteriological analysis shall be collected for at least two consecutive days and submitted for testing by a State Certified Laboratory, at no additional cost to the Owner. Samples of water will be contained in sterile containers obtained from the approved laboratory for analysis. Sample locations shall be in compliance with the FDEP construction permit for the potable water distribution system.

B. If samples do not demonstrate satisfactory results, repeat the disinfection and sampling procedures until two series of satisfactory samples are obtained, the period between such series of samples to be a minimum of twenty-four hours.

3.04 REPORTING

A. Results of the tests shall be submitted to the applicable regulatory agencies.

B. Prepare reports for purging and disinfecting activities and satisfactory laboratory bacteriological test results to Owner.

END OF SECTION

SECTION 15425
HYDROSTATIC TESTING OF PRESSURE PIPELINES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes furnishing labor, equipment, materials and transport for the installation and performance of a complete testing system of water distribution, consisting of pressure piping, valves and appurtenant items, as shown on the Drawings and specified herein.

PART 2- PRODUCTS

2.01 JOB CONDITIONS

A. Do not allow the pipelines being installed to be used as drains for water, and keep the ends of the pipe properly and adequately blocked during construction by the use of approved stoppers and not by improvised equipment.

B. Take all necessary precautions to prevent the entrance of mud, sand, or other obstructing matter into the pipelines and upon completion of the work, if any such material has entered, clean the pipelines as directed by Owner so that the entire system will be left clean and unobstructed.

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

A. Flushing: Flush all water mains with potable water to remove all sand and other foreign matter. Dispose of the flushing water without causing a nuisance or property damage.

B. Hydrostatic Tests:

1. Furnish, install and operate all pumps, gauges and measuring devices as approved by Owner. Perform all pressure and leakage testing in the presence of Owner.

2. Use only potable water for testing and flushing.

3. Test all components of the water distribution system, including fittings, connections and valves before backfilling, provided, however, that pipe trenches under traveled streets or roads or in unstable soil conditions may be backfilled with the permission of Owner.

4. Perform no testing until all concrete thrust blocking or restraint joints are in place and set. In testing, fill the part of the system under test with water and subject it to a sustained pressure of 150 pounds per square inch for water line. Test the system in sections, thereby testing each valve for secure closure.

5. While the system is being filled, carefully and completely exhaust the air. If permanent air vents are not located at all high points, install corporation stops or fittings and valves at such points so the air can be expelled as the pipe system is slowly filled with water.

6. Maintain test pressure by pumping for at least 2 hours and until all sections under test have been checked for evidence of leakage. Rate of loss shall not exceed that specified hereinafter. Correct visible leaks regardless of total leakage shown by test.

7. Retest the system as a whole, or any part, after completion of backfilling, as required for final acceptance.

C. Allowable Limits For Leakage:

1. No water main installation, or section thereof, will be acceptable until the leakage is less than the number of gallons per hour as determined by the formula:

$$L = \frac{SD\sqrt{P}}{133200}$$

in which,

L= Allowable leakage, in gallons per hour

S= Length of pipe being tested in feet

D= Nominal pipe diameter; in inches

P= Average test pressure during the test, in psi gauge.

2. For a 1000-foot segment of main with an average test pressure of 150 psi the following table may be used.

Pipe Diameter (D) Inches	Allowable Leakage (L) Gal/Hr.	Pipe Diameter (D) Inches	Allowable Leakage (L) Gal/Hr.
3	0.30	14	1.30
4	0.40	16	1.50
6	0.55	18	1.65
8	0.70	20	1.85
10	0.90	24	2.20
12	1.10	30	2.80

3. Supply water to the main during the test period as required, to maintain the test pressure as specified. Compare the quantity used, as measured by pumping from a calibrated container, to the above allowable quantity. A 5/8-inch meter installed on the discharge side of the pump may be used to measure the leakage for large mains when approved by Owner.

D. Correction of Work:

1. Where leakage exceeds the allowable limit, as specified hereinbefore, locate and repair the defective pipe or joints. If the defective portions cannot be located, remove and reconstruct as much of the work as is necessary in order to conform to the specified limits.

2. Repair or replace any visible leaks or any defective pipe or joint as directed by Owner even though the total leakage is within the specified allowable limits.

3. No additional payment will be made for the correction of defective work, or to damage to other parts of the work resulting from such corrective work.

END OF SECTION

Division 16
Electrical

SECTION 16050
BASIC ELECTRICAL MATERIALS & METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Common electrical installation requirements.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Test Equipment Suitability and Calibration: Comply with NETA ATS, "Suitability of Test Equipment" and "Test Instrument Calibration."

1.4 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
5. So that underground raceways that extend under the building grade slab are routed clear of footings, grade beams and similar including drainage provisions and the work of other trades. Where the number of sweeps or bends exceeds practical limits, furnish and install hand holes, manholes and similar appurtenances to facilitate the pulling in of cables.
6. So that raceways run “overhead” are located at elevations and in such a manner that does not interfere with the work of other trades or restrict proper use and access of the area or space in which the raceway is located. In particular locate circuitry to Connector Strips at a suitable elevation above the catwalks.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 8 Section "Access Doors and Frames."

D. Coordinate electrical testing of electrical, mechanical, and architectural items, so equipment and systems that are functionally interdependent are tested to demonstrate successful interoperability.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Plastic. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

C. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with Division 7 Section "Through-Penetration Firestop Systems."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Through-Penetration Firestop Systems."

END OF SECTION

SECTION 16060
GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 3/0 stranded.
5. Bonding Conductor: No. 4, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.2 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, sizes, 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.

2.3 GROUNDING ELECTRODES

A. Ground Rods: copper-clad steel ¾" x 20'.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for #10 AWG and smaller, and stranded conductors for #8 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 3/0 AWG minimum. Bury at least 24 inches (600 mm) below grade.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. 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.

D. 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.

3.2 EQUIPMENT GROUNDING

A. 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.
7. Armored and metal-clad cable runs.
8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater: Install a separate insulated equipment grounding conductor to each electric water heater. Bond conductor to heater units, piping, connected equipment, and components.

D. 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.

E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. 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, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6-by-50-by-300-mm) grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

G. Metal or Wood Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor 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 three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 2 Section "Underground Ducts and Utility Structures," and shall be at least 12 inches (300 mm) deep, with cover.

1. Test Wells: Install at least one test well for each service, unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any 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.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

3.4 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 grounding terminal, and at ground test wells.

    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 and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

B. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).

C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 16072
ELECTRICAL SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.2 SUBMITTALS

A. Product Data: Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of component used.

1.3 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed under this Project, with a minimum structural safety factor of 5 times the applied force.

B. Steel Slotted Support Systems: Comply with MFMA-3, factory-fabricated components for field assembly, and provide finish suitable for the environment in which installed.

1. Manufacturers:

    a. Cooper B-Line; a division of Cooper Industries.
    b. ERICO International Corporation.
    c. Allied Support Systems; Power-Strut Unit.
    d. GS Metals Corp.
    e. Michigan Hanger Co., Inc.; O-Strut Div.
    f. National Pipe Hanger Corp.
    g. Thomas & Betts Corporation.
    h. Unistrut; Tyco International, Ltd.
    i. Wesanco, Inc.

2. Channel Dimensions: Selected for structural loading

C. Raceway and Cable Supports: As described in NECA 1.

D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

    a. Manufacturers:

        1) Cooper B-Line; a division of Cooper Industries.
        2) Empire Tool and Manufacturing Co., Inc.
        3) Hilti, Inc.
        4) ITW Construction Products.
        5) MKT Fastening, LLC.
        6) Powers Fasteners.

2. Concrete Inserts: Steel or malleable-iron slotted-support-system units similar to MSS Type 18; complying with MFMA-3 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.

6. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 5 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 for application of hangers and supports for electrical equipment and systems, unless requirements in this Section or applicable Code are stricter.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 for installation requirements, except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods, unless otherwise indicated by Code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: [Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts] [Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69] [Spring-tension clamps].
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 5 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions.

B. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so expansion anchors will be a minimum of 10 bolt diameters from edge of the base.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of the base.
2. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
6. Use 3000-psi (20.7-MPa)], 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 3 Section "Cast-in-Place Concrete (Limited Applications)."

END OF SECTION

SECTION 16075
ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Identification for conductors and communication and control cable.
2. Warning labels and signs.
3. Equipment identification labels.

1.2 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

1.4 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Marker Tape: Vinyl or vinyl -cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 WARNING LABELS AND SIGNS

A. Comply with NFPA 70, NFPA 70 E and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 10 by 14 inches (250 by 360 mm).

E. Fasteners for Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

F. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 mm)."
3. PPE Personnel protection equipment labels identifying level of hazard and the required protective items as prescribed by NEC 70 E.

2.3 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.

B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

PART 3 - EXECUTION

3.1 APPLICATION

A. Auxiliary Electrical Systems Conductor and Cable Identification: Use marker tape to identify field-installed alarm, control, signal, sound, intercommunications, voice, and data wiring connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and cable pull points. Identify by system and circuit designation.
2. Use system of designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

B. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply [self-adhesive warning labels]. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:

a. Power transfer switches.
b. Controls with external control power connections.

2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

C. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor Equipment: [Self-adhesive, engraved, laminated acrylic or melamine label]. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where 2 lines of text are required, use labels 2 inches (50 mm) high.
b. Outdoor Equipment: Engraved, laminated acrylic or melamine label, drilled for screw attachment.
c. Elevated Components: Increase sizes of labels and legend to those appropriate for viewing from the floor.

2. Equipment to Be Labeled:

a. Panelboards, electrical cabinets, and enclosures.
b. Electrical switchgear and switchboards.
c. Transformers.
d. Motor-control centers.
e. Disconnect switches.
f. Enclosed circuit breakers.
g. Motor starters.
h. Push-button stations.
i. Power transfer equipment.
j. Contactors.

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.

1. Color shall be factory applied.
2. Colors for 208/120-V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.

3. Colors for 480/277-V Circuits:

    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Phase C: Yellow.

END OF SECTION

SECTION 16120
CONDUCTORS & CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.
3. Sleeves and sleeve seals for cables.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Aluminum and Copper Conductors: Comply with NEMA WC 70.

B. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN, THHW and other insulation types as required based on the environment to which the conductor will be subjected.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.
6. Ilsco
7. NSI Industries – “Polaris Taps”

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

D. Where required due to limitations on the “approved termination devices” provided with equipment (approved for use by the AHJ, the contractor shall provided “transition boxes” and connectors to allow for the reduction of conductor size (oversized to account for voltage drop) to occur without voiding warranties or violating code limitations on wire bending space, clearance or cross sectional area limits.

2.3 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

2.4 SLEEVE SEALS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

D. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Plastic, include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHW or THHN-THWN, single conductors in raceway.

B. Exposed Feeders: Type THHW or THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHW or THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHW or THHN-THWN, single conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHW or THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHW or THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHW or THHN-THWN, single conductors in raceway.

H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

I. Class 1 Control Circuits: Type THHW or THHN-THWN, in raceway.

J. Class 2 Control Circuits: Type THHW or THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 16 Section "Electrical Supports".

F. Identify and color-code conductors and cables according to Division 16 Section "Electrical Identification."

G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

I. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.4 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

D. Cut sleeves to length for mounting flush with both wall surfaces.

E. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

F. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and cable unless sleeve seal is to be installed.

G. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 7 Section "Joint Sealants."

I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 7 Section "Through-Penetration Firestop Systems."

J. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

K. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

L. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.5 SLEEVE-SEAL INSTALLATION

A. Install to seal underground exterior-wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 7 Section "Through-Penetration Firestop Systems."

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test[service entrance and feeder conductors, and conductors feeding the following critical equipment and services] for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 16130
RACEWAYS & BOXES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. See Division 2 Section "Underground Ducts and Utility Structures" for exterior ductbanks and manholes, and underground handholes, boxes, and utility construction.

1.2 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, details, and attachments to other work.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. IMC: ANSI C80.6.

C. EMT: ANSI C80.3.

D. FMC: Zinc-coated steel.

E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Steel, set-screw or compression type.

2.2 NONMETALLIC CONDUIT AND TUBING

A. ENT: NEMA TC 13.

B. RNC: NEMA TC 2, Type EPC-80-PVC unless otherwise indicated.

C. LFNC: UL 1660.

D. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

E. Fittings for LFNC: UL 514B.

2.3 METAL WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.

C. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.

D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

E. Wireway Covers: As indicated.

F. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hoffman.
2. Lamson & Sessions; Carlon Electrical Products.

C. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.

D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.5 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Thomas & Betts Corporation.
b. Walker Systems, Inc.; Wiremold Company (The).
c. Wiremold Company (The); Electrical Sales Division.

B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Butler Manufacturing Company; Walker Division.
b. Enduro Systems, Inc.; Composite Products Division.
c. Hubbell Incorporated; Wiring Device-Kellems Division.
d. Lamson & Sessions; Carlon Electrical Products.
e. Panduit Corp.
f. Walker Systems, Inc.; Wiremold Company (The).
g. Wiremold Company (The); Electrical Sales Division.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.

C. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

D. Metal Floor Boxes: Cast or sheet metal, fully adjustable, rectangular.

E. Nonmetallic Floor Boxes: Nonadjustable, round.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

H. Weatherproof, While-in-use Enclosures: NEMA 250, Type 3R, hinged, cord-opening gasket, lockable, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Only acceptable within elevator pits. Plastic finished inside with radio-frequency-resistant paint.

I. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: GRC or IMC.
2. Concealed Conduit Aboveground: SCH 80 PVC.
3. Underground Conduit: 80-PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC or LFNC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed: EMT.

2. Concealed in Ceilings and Interior Walls and Partitions: EMT (MC Cable may be used in interior walls only).
3. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, nonmetallic in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch (16-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 16 Section "Electrical Supports and Seismic Restraints."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

H. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.

I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

K. Raceways for Optical Fiber and Communications Cable: Install as follows:

1. 3/4-Inch (19-mm) Trade Size and Smaller: Install raceways in maximum lengths of 50 feet (15 m).
2. 1-Inch (25-mm) Trade Size and Larger: Install raceways in maximum lengths of 75 feet (23 m).
3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

M. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m).

1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:

   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
   c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
   d. Attics: 135 deg F (75 deg C) temperature change.

2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change.
3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

N. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

O. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

P. Set metal floor boxes level and flush with finished floor surface.

Q. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 2 Section "Earthwork" for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Division 2 Section "Earthwork."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 2 Section "Earthwork."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
    b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

6. Warning Tape: Bury warning tape approximately 12 inches (300 mm) above direct-buried conduits, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of conduit.

3.4 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Through-Penetration Firestop Systems."

END OF SECTION

SECTION 16140
WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Wall-box motion sensors.
3. Snap switches and wall-box dimmers.
4. Solid-state fan speed controls.
5. Wall-switch and exterior occupancy sensors.
6. Communications outlets.

B. See Division 16 Section "Voice and Data Communication Cabling" for workstation outlets.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

D. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 5351 (single), 5352 (duplex).
b. Hubbell; HBL5351 (single), CR5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).
d. Pass & Seymour; 5381 (single), 5352 (duplex).

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, feed through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; GF20.
b. Pass & Seymour; 2084.

2.4 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
    b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
    c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
    d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

C. Pilot Light Switches, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper; 2221PL for 120 V and 277 V.
    b. Hubbell; HPL1221PL for 120 V and 277 V.
    c. Leviton; 1221-PLR for 120 V, 1221-7PLR for 277 V.
    d. Pass & Seymour; PS20AC1-PLR for 120 V.

3. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."

D. Key-Operated Switches, 120/277 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper; 2221L.
    b. Hubbell; HBL1221L.
    c. Leviton; 1221-2L.
    d. Pass & Seymour; PS20AC1-L.

3. Description: Single pole, with factory-supplied key in lieu of switch handle.

E. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

2. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper; 1995.
    b. Hubbell; HBL1557.
    c. Leviton; 1257.
    d. Pass & Seymour; 1251.

F. Key-Operated, Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper; 1995L.
    b. Hubbell; HBL1557L.
    c. Leviton; 1257L.
    d. Pass & Seymour; 1251L.

2.5 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable rotary knob; with single-pole or three-way switching. Comply with UL 1472.

C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.

1. 1200 W; dimmers shall require no derating when ganged with other devices.

D. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.6 FAN SPEED CONTROLS

A. Modular, 120-V, full-wave, solid-state units with integral, quiet on-off switches and audible frequency and EMI/RFI filters. Comply with UL 1917.

1. Continuously adjustable rotary knob, 5 A.

2.7 OCCUPANCY SENSORS

A. Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper; 6111 for 120 V, 6117 for 277 V.
    b. Hubbell; WS1277.
    c. Leviton; ODS 10-ID.
    d. Pass & Seymour; WS3000.
    e. Watt Stopper (The); WS-200.

3. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).

B. Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Hubbell; AT120 for 120 V, AT277 for 277 V.
    b. Leviton; ODS 15-ID.

3. Description: Adaptive-technology type, 120/277 V, adjustable time delay up to 20 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).

C. Long-Range Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Hubbell; ATP1600WRP.
    b. Leviton; ODWWV-IRW.
    c. Pass & Seymour; WA1001.
    d. Watt Stopper (The); CX-100.

3. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, with a minimum coverage area of 1200 sq. ft. (111 sq. m).

D. Long-Range Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Hubbell; ATD1600WRP.
    b. Leviton; ODW12-MRW.
    c. Watt Stopper (The); DT-200.

3. Description: Dual technology, with both passive-infrared- and ultrasonic-type sensing, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, and a minimum coverage area of 1200 sq. ft. (111 sq. m).

E. Wide-Range Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Hubbell; ATP120HBRP.
    b. Leviton; ODWHB-IRW.
    c. Pass & Seymour; HS1001.
    d. Watt Stopper (The); CX-100-3.

3. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 150-degree field of view, with a minimum coverage area of 1200 sq. ft. (111 sq. m).

F. Exterior Occupancy Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Leviton; PS200-10.
    b. Watt Stopper (The); EW-100-120.

3. Description: Passive-infrared type, 120/277 V, weatherproof, adjustable time delay up to 15 minutes, 180-degree field of view, and 110-foot (34-m) detection range. Minimum switch rating: 1000-W incandescent, 500-VA fluorescent.

2.8 COMMUNICATIONS OUTLETS

A. Telephone Outlet:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

2. Products: Subject to compliance with requirements, provide one of the following:

   a. Cooper; 3560-6.
   b. Leviton; 40649.

3. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1 complying with Category 5e. Comply with UL 1863.

B. Combination TV and Telephone Outlet:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

   a. Cooper; 3562.
   b. Leviton; 40595.

3. Description: Single RJ-45 jack for 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e; and one Type F coaxial cable connector.

2.9 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic [0.035-inch-(1-mm-)
3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant die-cast aluminum with lockable cover.

2.10 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular, die-cast aluminum with satin finish.

D. Power Receptacle: NEMA WD 6 configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: Blank cover with bushed cable opening.

2.11 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: White, unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.
3. TVSS Devices: Blue.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

a. Cut back and pigtail, or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 IDENTIFICATION

A. Comply with Division 16 Section "Electrical Identification."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with white-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.

6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new, and retest as specified above.

END OF SECTION

SECTION 16211
ELECTRICITY METERING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes equipment for utility company's electricity metering.

1.2 SUBMITTALS

A. Product Data: For each metering component specified.

B. Shop Drawings for Electricity-Metering Equipment: Include dimensioned plans and sections or elevation layouts. Include wiring diagrams showing power, signal, and control wiring specific to this Project.

C. Operation and Maintenance Data: For electricity-metering equipment to include in emergency, operation, and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Receive, store, and handle modular meter center as specified in NECA 400.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Architect's written permission.

1.6 COORDINATION

A. Electrical Service Connections: Coordinate with utility companies and components they furnish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 EQUIPMENT FOR ELECTRICITY METERING BY UTILITY COMPANY

A. Current-Transformer Cabinets: Comply with requirements of electrical power utility company. Where CT’s are installed at the Utility transformer, follow instructions and provide metering pedestal and other items as directed.

B. Meter Sockets: Comply with requirements of electrical power utility company.

1. Meter Socket: Type as approved by utility company, with rating coordinated with indicated tenant feeder circuit rating.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with equipment installation requirements in NECA 1.

B. Install equipment for utility company metering. Install raceways and equipment according to utility company's written requirements. Provide empty conduits for metering leads and extend grounding connections as required by utility company.

END OF SECTION

SECTION 16289
TRANSIENT VOLTAGE SUPRESSION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes TVSSs for low-voltage power equipment.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating weights, operating characteristics, furnished specialties, and accessories.

B. Field quality-control test reports.

C. Operation and Maintenance Data.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with IEEE C62.41, "IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits," and test devices according to IEEE C62.45, "IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits."

D. Comply with NEMA LS 1, "Low Voltage Surge Protection Devices."

E. Comply with UL 1283, "Electromagnetic Interference Filters," and UL 1449, "Transient Voltage Surge Suppressors."

1.4 PROJECT CONDITIONS

A. Service Conditions: Rate surge protection devices for continuous operation under the following conditions, unless otherwise indicated:

1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
2. Operating Temperature: 30 to 120 deg F (0 to 50 deg C).
3. Humidity: 0 to 85 percent, noncondensing.
4. Altitude: Less than 20,000 feet (6090 m) above sea level.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advanced Protection Technologies, Inc.
2. Atlantic Scientific.
3. Current Technology, Inc.
4. Cutler-Hammer, Inc.; Eaton Corporation.
5. Entrelec International.
6. General Electric Company.
7. Innovative Technology, Inc.
8. Intermatic, Inc.
9. LEA International.
10. Leviton Mfg. Company Inc.
11. Liebert Corporation; a division of Emerson.
12. Northern Technologies, Inc.
13. Siemens Energy & Automation, Inc.
14. Square D; Schneider Electric.
15. Surge Suppression Incorporated.
16. Sutton Designs Inc.
17. Transtector Systems, Inc.
18. Tycor; Cutler-Hammer, Inc.
19. United Power Corporation.
20. Zero Surge Inc.

2.2 SERVICE ENTRANCE SUPPRESSORS

A. Surge Protection Device Description: Non-modular, sine-wave-tracking type with the following features and accessories:

1. LED indicator lights for power and protection status.
2. Audible alarm, with silencing switch, to indicate when protection has failed.
3. Fuses, rated at 200-kA interrupting capacity.
4. Integral disconnect switch.
5. Redundant suppression circuits.
6. Surge-event operations counter.

B. Peak Single-Impulse Surge Current Rating: 320 kA per phase.

C. Connection Means: Permanently wired.

D. Protection modes and UL 1449 suppressed voltage rating for grounded wye circuits with voltages of 480Y/277,208Y/120] 3-phase, 4-wire circuits shall be as follows:

1. Line to Neutral: 800 V for 480Y/277, 400 V for 208Y/120.
2. Line to Ground: 800 V for 480Y/277,400 V for 208Y/120.
3. Neutral to Ground: 800 V for 480Y/277,400 V for 208Y/120.

E. Protection modes and UL 1449 suppressed voltage rating for 240/120-V, single-phase, 3-wire circuits shall be as follows:

1. Line to Neutral: 400 V.
2. Line to Ground: 400 V.
3. Neutral to Ground: 400 V.

F. Protection modes and UL 1449 suppressed voltage rating for 240/120-V, 3-phase, 4-wire circuits with high leg shall be as follows:

1. Line to Neutral: 400 V, 800 V from high leg.
2. Line to Ground: 400 V.
3. Neutral to Ground: 400 V.

G. Protection modes and UL 1449 suppressed voltage rating for voltages of 240 or 480, 3-phase, 3-wire, delta circuits shall be as follows:

1. Line to Line: 2000 V for 480 V, 1000 V for 240 V.
2. Line to Ground: 2000 V for 480 V, 1000 V for 240 V.

2.3 PANELBOARD SUPPRESSORS

A. Surge Protection Device Description: Non-modular, sine-wave-tracking type with the following features and accessories:

1. LED indicator lights for power and protection status.
2. Audible alarm, with silencing switch, to indicate when protection has failed.
3. Fuses, rated at 200-kA interrupting capacity.
4. Integral disconnect switch.
5. Redundant suppression circuits.
6. Surge-event operations counter.

B. Peak Single-Impulse Surge Current Rating: 160 kA per phase.

C. Protection modes and UL 1449 suppressed voltage rating for grounded wye circuits with voltages of 480Y/277, 208Y/120, 3-phase, 4-wire circuits shall be as follows:

1. Line to Neutral: 800 V for 480Y/277, 400 V for 208Y/120.
2. Line to Ground: 800 V for 480Y/277, 400 V for 208Y/120
3. Neutral to Ground: 800 V for 480Y/277, 400 V for 208Y/120

D. Protection modes and UL 1449 suppressed voltage rating for 240/120-V, single-phase, 3-wire circuits shall be as follows:

1. Line to Neutral: 400 V.
2. Line to Ground: 400 V.
3. Neutral to Ground: 400 V.

E. Protection modes and UL 1449 suppressed voltage rating for 240/120-V, 3-phase, 4-wire circuits with high leg shall be as follows:

1. Line to Neutral: 400 V, 800 V from high leg.
2. Line to Ground: 400 V.
3. Neutral to Ground: 400 V.

F. Protection modes and UL 1449 suppressed voltage rating for voltages of 240 or 480, 3-phase, 3-wire, delta circuits shall be as follows:

1. Line to Line: 2000 V for 480 V, 1000 V for 240 V.
2. Line to Ground: 1500 V for 480 V, 800 V for 240 V.

2.4 SUPPRESSORS FOR ELECTRONIC-GRADE PANELBOARDS

A. Surge Protection Device Description: Sine-wave-tracking type, panel-mounted design with the following features and accessories:

1. LED indicator lights for power and protection status.
2. Audible alarm, with silencing switch, to indicate when protection has failed.
3. Arrangement with wire connections to phase buses, neutral bus, and ground bus.

B. Peak Single-Impulse Surge Current Rating: 160kA per phase.

C. Protection modes and UL 1449 suppressed voltage rating for grounded wye circuits with voltages of 480Y/277, 208Y/120, 3-phase, 4-wire circuits shall be as follows:

1. Line to Neutral: 800 V for 480Y/277, 400 V for 208Y/120
2. Line to Ground: 800 V for 480Y/277, 400 V for 208Y/120
3. Neutral to Ground: 800 V for 480Y/277, 400 V for 208Y/120

D. Protection modes and UL 1449 suppressed voltage rating for 240/120-V, single-phase, 3-wire circuits shall be as follows:

1. Line to Neutral: 400 V.
2. Line to Ground: 400 V.
3. Neutral to Ground: 400 V.

E. Protection modes and UL 1449 suppressed voltage rating for 240/120-V, 3-phase, 4-wire circuits with high leg shall be as follows:

1. Line to Neutral: 400 V, 800 V from high leg.
2. Line to Ground: 400 V.
3. Neutral to Ground: 400 V.

F. Protection modes and UL 1449 suppressed voltage rating for voltages of 240, 480, or 600, 3-phase, 3-wire, delta circuits shall be as follows:

1. Line to Line: 2000 V for 480 V, 1000 V for 240 V.
2. Line to Ground: 1500 V for 480 V, 800 V for 240 V.

2.5 ENCLOSURES

A. NEMA 250, with type matching the enclosure of panel or device being protected.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTION DEVICES

A. Install devices at service entrance on load side, with ground lead bonded to service entrance ground.

B. Install devices for panelboard and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

1. Provide multipole, 30, 60 or 100]-A circuit breaker as a dedicated disconnect for suppressor, unless otherwise indicated.

3.2 PLACING SYSTEM INTO SERVICE

A. Do not energize or connect [service entrance equipment] [panelboards] [control terminals] [data terminals] to their sources until surge protection devices are installed and connected.

3.3 FIELD QUALITY CONTROL

A. Testing: [Owner will engage] [Engage] a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports:

B. Testing: Perform the following field tests and inspections and prepare test reports:

1. Complete startup checks according to manufacturer's written instructions.
2. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, "Surge Arresters, Low-Voltage Surge Protection Devices" Section. Certify compliance with test parameters.

END OF SECTION

SECTION 16410
ENCLOSED SWITCHES & CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following individually mounted, enclosed switches and circuit breakers:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers.
4. Enclosures.

1.2 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Siemens Energy & Automation, Inc.
4. Square D/Group Schneider.

B. Fusible Switch, 600 A and Smaller: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Nonfusible Switch, 600A and Smaller: NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.
3. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

2.3 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Moeller Electric Corporation.
4. Siemens Energy & Automation, Inc.
5. Square D/Group Schneider.

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.

4. GFCI Circuit Breakers: Single- and two-pole configurations with [5]-mA trip sensitivity.

C. Molded-Case Circuit-Breaker Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style with compression lug kits suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
4. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
5. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

2.4 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.

B. Concrete base is specified in Division 16 Section "Basic Electrical Materials and Methods Electrical Supports and Seismic Restraints," and concrete materials and installation requirements are specified in Division 3.

C. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

D. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

E. Comply with mounting and anchoring requirements specified in Division 16 Section "Seismic Controls for Electrical WorkElectrical Supports and Seismic Restraints."

F. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

G. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section “Electrical Identification."

3.2 FIELD QUALITY CONTROL

A. Prepare for acceptance testing as follows:

1. Inspect mechanical and electrical connections.
2. Verify switch and relay type and labeling verification.
3. Verify rating of installed fuses.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION

SECTION 16442
PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

    a. Enclosure types and details for types other than NEMA 250, Type 1.
    b. Bus configuration, current, and voltage ratings.
    c. Short-circuit current rating of panelboards and overcurrent protective devices.
    d. UL listing for series rating of installed devices.
    e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

2. Wiring Diagrams: Power, signal, and control wiring.
3. Field quality-control test reports.
4. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:

a. Eaton Corporation; Cutler-Hammer Products.
b. General Electric Co.; Electrical Distribution & Protection Div.
c. Siemens Energy & Automation, Inc.
d. Square D.

2.2 MANUFACTURED UNITS

A. Enclosures: Flush- and surface mounted cabinets. NEMA PB 1, Type 1.

1. Rated for environmental conditions at installed location.

a. Indoor Locations: NEMA 250, Type 1.
b. Other Wet or Damp Indoor Locations: NEMA 250, Type 3R

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.

B. Phase and Ground Buses: Hard-drawn copper, 98 percent conductivity.

C. Conductor Connectors: Suitable for use with conductor material.

1. Ground Lugs and Bus Configured Terminators: Compression type.

D. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.

E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

F. Panelboard Short-Circuit Rating:

1. UL label indicating series-connected rating with integral or remote upstream overcurrent protective devices. Include size and type of upstream device

allowable, branch devices allowable, and UL series-connected short-circuit rating.

2.3 DISTRIBUTION PANELBOARDS

A. Doors: Secured with vault-type latch with tumbler lock; keyed alike. Omit for fused-switch panelboards.

B. Main Overcurrent Protective Devices: Circuit breaker or Fused switch.

C. Branch Overcurrent Protective Devices:

1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in circuit breakers.
2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
3. Fused switches.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

C. Non-Dimmed Panels “ND” as defined in the DSL documents are to be equipped with micro-processor based programmable logic controllers as manufactured by Eaton and of the “Power Command” style or “Lyn Tec” style.

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: UL 489, with series-connected rating to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.
3. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

    a. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.
    b. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

c. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

B. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

C. Fuses are specified in Division 16 Section "Fuses."

2.6 CONTROLLERS

A. Motor Controllers: NEMA ICS 2, Class A, combination controller equipped for panelboard mounting and including the following accessories:

1. Individual control-power transformers.
2. Fuses for control-power transformers.
3. Bimetallic-element overload relay.
4. Indicating lights.
5. Seal-in contact.
6. 2 convertible auxiliary contacts.
7. Push buttons.
8. Selector switches.

B. Contactors: NEMA ICS 2, Class A, combination controller equipped for panelboard mounting and including the following accessories:

1. Individual control-power transformers.
2. Fuses for control-power transformers.
3. Indicating lights.
4. Seal-in contact.
5. 2 convertible auxiliary contacts.
6. Push buttons.
7. Selector switches.

C. Controller Disconnect Switches: Fused switch mounted adjacent to and interlocked with controller.

1. Auxiliary Contacts: Integral with disconnect switches to de-energize external control-power source.

D. Contactors in Main Bus: NEMA ICS 2, Class A, mechanically held general-purpose controller.

1. Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.
2. Control-Power Source: 120-V branch circuit.

2.7 ACCESSORY COMPONENTS AND FEATURES

A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Furnish portable test set to test functions of solid-state trip devices without removal from panelboard.

C. Fungus Proofing: Permanent fungicidal treatment for panelboard interior, including overcurrent protective devices and other components.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Comply with mounting and anchoring requirements specified in Division 16 Section " r Electrical Work Electrical Supports."

C. Mount top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.

D. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

E. Install overcurrent protective devices and controllers.

1. Set field-adjustable switches and circuit-breaker trip ranges.

F. Install filler plates in unused spaces.

G. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.

H. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification."

I. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

J. Ground equipment according to Division 16 Section "Grounding and Bonding."

K. Connect wiring according to Division 16 Section "Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION

SECTION 16530
EXTERIOR LUMINARIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.

B. The purpose of these specifications is to define the performance and design standards for JYP Park Soccer field lighting. The manufacturer / contractor shall supply lighting equipment to meet or exceed the standards set forth by the criteria set forth in these specifications.

C. The sports lighting will be for the following fields:

1. 2 – 430’ x 235’ Soccer Fields

D. The primary goals of this sports lighting project are:

1. Provide long term I.E.S. Class III soccer field lighting on the field
2. Guaranteed Light Levels: Selection of appropriate light levels impact the safety of the players and the enjoyment of spectators. Therefore the lighting system shall be designed such that the light levels are guaranteed to remain at or above target light values throughout the 25 years of the contract by the manufacturer.
3. Life Cycle Cost: In order to reduce the operating budget, the preferred lighting system shall be energy efficient and cost effective to operate. All maintenance costs shall be eliminated, and the field(s) should be proactively monitored to detect fixture outages over a 25 year life cycle. To allow for optimized use of labor resources and avoid unneeded operation of the facility, customer requires a remote on/off control system for the lighting system.
4. Environmental Light Control: It is the primary goal of this project to minimize spill light and glare to the players, spectators and adjoining properties

E. Design and Permitting
1. Contractor shall be responsible for securing necessary permits.

1.2 PERFORMANCE REQUIREMENTS – There are two methods for maintaining light levels. Either is acceptable under the conditions set forth in the specifications.

A. METHOD #1 – Timed Power Adjustment System – Performance Requirements: Playing surfaces shall be lit to an average constant light level and uniformity as specified in the chart below. Light levels shall be held constant for 25 years. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below. Measured average illumination level shall be at or above predicted mean in accordance with IESNA RP-6-01, and measured upon lighting system ignition.

Lighting system to provide light levels as described below

Area of Lighting	Average Maintained Light Levels or Constant Light Level	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Soccer 1	30 fc	2.0:1.0	120	30' x 30'
Soccer 2	30 fc	2.0:1.0	120	30' x 30'

Based on anticipated hours of usage (500 hours per year), METHOD #1 systems would require a minimum of 2 group lamp replacements over the 25 years.

1. Those manufacturers bidding METHOD #1 must use I.E.S. Lumen maintenance control strategy: Automatic power adjustments to achieve a lumen maintenance control strategy as described in the IESNA Lighting Handbook 9th Edition Lighting Controls Section pages 27-2 and 27-3: "Lumen maintenance control strategy calls for reducing the initial illumination of a new system to the designed minimum level. As lumen depreciation occurs, more power is applied to the lamps in order to maintain constant output." Other technologies refer to 1.7 B or METHOD #2.

2. Independent Test Report: Manufacturers bidding as a timed power adjustment system must provide an independent test report verifying the field performance of the system for the duration of the life of the lamp, signed by a licensed professional engineer with outdoor lighting experience and no affiliation with the manufacturer. If report is not provided at least 10 days prior to bid opening, the manufacturer shall provide the initial and maintained designs called for in this specification in section 1.2 B (METHOD #2).

3. Project References: Manufacturers bidding any form of a constant light system must provide a minimum of five (5) project references within the state of Florida that have been completed within the last calendar year utilizing this exact technology. Manufacturer will include project name, project city, and if requested, contact name and contact phone number for each reference.

B. METHOD #2 – Initial / Maintained Lighting Systems

1. Compliance to Specifications: It is the Contractor's responsibility to comply fully with the requirements of these specifications. Any exceptions to the specifications must be clearly stated in the prior approval submittal documents.

2. Light Level Requirements: Manufacturer shall provide computer models guaranteeing light levels on the field over 25 years. If I.E.S. recognized constant light levels cannot be provided, the specified maximum Recoverable Light Loss Factor and maintenance/group relamping schedule shall be provided in accordance with recommendations in the Leukos Abstract Volume 6, Number 3, January 2010, page 183-201: “Light Loss Factors for Sports Lighting”, and presented at the 2009 IESNA Annual Conference. For METHOD #2 systems, scans for both initial and maintained light levels shall be submitted.

1500w Fixture RLLF Requirements

Lamp Replacement Interval (hours)	Recoverable Light Loss Factor (RLLF)
2100	0.69

Based on anticipated hours of usage (500 hours per year), METHOD #2 systems would require a minimum of 6 group lamp replacements over the 25 years.

Area of Lighting	Average Initial Light Levels	Average Maintained Light	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Soccer 1	43.5fc	30fc	2.0:1.0	120	30’ x 30’
Soccer 2	43.5fc	30fc	2.0:1.0	120	30’ x 30’

1.3 ENVIRONMENTAL LIGHT CONTROL

A. ENVIRONMENTAL LIGHT CONTROL

Glare Control - The installed lighting system must provide light control in order to be environmentally responsible, provide good playability, and ensure the facility is aesthetically pleasing to the community.

Fixtures must have an external visor to reduce glare as well as spill light. Horizontal optic fixtures are not allowed. High output lamps (over 162,000 lumens) are not allowed.

1. Photometric spill scans must be submitted indicating the amount of horizontal spill on the property lines (see scans). These numbers must average below .70fc. 405 target points are to be used for these calculations using a 30’ grid pattern.
2. Residential Property Line - These numbers must have a maximum individual reading of 0.66fc. using a 30’ grid pattern
3. Non-Residential Property Line - These numbers must have a maximum individual reading of 12.2fc. using a 30’ grid pattern.

4. Photometric reports must be provided to demonstrate the capability of achieving the following specified performance. Reports shall be certified by a qualified independent testing laboratory with a minimum of five years experience or by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. ITL reports will remain confidential and be returned to the manufacturer after the bid is awarded.
5. Luminaire Mounting Height – Proper mounting heights allow for sufficient vertical aiming angles which reduce glare and help ensure the illumination on the playing field is balanced, providing adequate modeling of the ball for optimal playability. The basis of design for this project would require mounting heights as indicated in the chart below

Field	Poles
Soccer Field 1	80' mh
Soccer Field 2	80' mh

4. Upper Beam Definition

No fixture shall exceed the candlepower at the specified degrees above the center of the beam in the vertical plane as specified in the following table.

NEMA Classification of Vertical Beam	Candela	Degrees Above the Center of the Beam in the Vertical Plane
4	10,000	15.0 degrees

If a manufacturer's photometric report indicates that they cannot meet this criteria, they may increase mounting heights (see below) to maintain the same impact for playability, spectator comfort and impact on the adjoining properties. If a manufacturer's photometric report indicates that they can achieve 10,000 candela at an angle below 19.5 degrees they may decrease mounting heights using the formula below, providing aiming angles abide by I.E.S. good lighting practices

This mounting height increase/decrease will be calculated by referencing the fixture photometric report and determining the angle above or below vertical that the fixture achieves a candela reading less than or equal to 10,000 candela. Pole heights will be increased/decreased 3.33' for every one degree above/below 15.0 degrees needed to achieve a candela reading of 10,000. For example: If 10,000 candela is achieved at 19.5 degrees above vertical, a minimum mounting height of 95.0' (4.5 degrees x 3.33') would be required for the poles.\

1.4 LIFE CYCLE COSTS

A. Energy Consumption: The average kWh consumption for the field lighting system is designed to be 125.12 kW or less.
B. Complete Lamp Replacement: Manufacturer shall include all group lamp replacements required to provide 25 years of operation based upon 500 usage hours per year.

C. Preventative and Spot Maintenance: Manufacturer shall provide all preventative and spot maintenance, including parts and labor for 25 years from the date of equipment shipment. Individual lamp outages shall be repaired when the usage of any field is materially impacted. Owner agrees to check fuses in the event of a luminaire outage.

D. Remote Monitoring System: See Section 2.1

E. 25-Year Life Cycle Cost: Manufacturer shall submit 25-year life cycle cost calculations as follows. Equipment price and total life cycle cost shall be entered separately on bid form. This information will be used in evaluating the best value.

a.	Luminaire energy consumption # luminaires x __kW demand per luminaire x .186kWh rate x 500 annual usage hours x 25 years		
	TOTAL 25-Year Energy Operating Cost	=	

Group lamp replacements for METHOD #1 systems must occur in accordance with the independent test report provided by the manufacturer; METHOD #2 systems must replace lamps every 2100 hours in accordance with recommendations in the Leukos Abstract Volume 6, Number 3, January 2010, page 183-201: “Light Loss Factors for Sports Lighting”, and presented at the 2009 IESNA Annual Conference.

Warranty: Provide warranty/maintenance document as required in section 1.5. Variations MUST be noted.

Life Cycle Analysis and re-lamp schedule per section 1.2 - B, 2. Variations MUST be noted.

QUALITY ASSURANCE

Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1.5 WARRANTY AND GUARANTEE

A. 25-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years. Warranty shall guarantee light levels; lamp replacements; system energy consumption; monitoring, maintenance and control services, spill light control, and structural integrity. Warranty may exclude fuses, storm damage, vandalism, abuse and unauthorized repairs or alterations.

1) Manufacturer shall maintain specifically-funded financial reserves to assure fulfillment of the warranty for the full term.

2) Manufacturer must have employees/technicians to service the equipment located within a 60 mile radius. This is in addition to a network of contractors used to service the system.

3) If the control system is not provided by the manufacturer of the lighting system, the manufacturer of the Control System must have employees/technicians to service the equipment located within a 60 mile radius. This is in addition to a network of contractors used to service the system.

1.6 DELIVERY TIMING

A. Equipment On-Site: The equipment must be on-site 4-6 weeks from receipt of approved submittals and receipt of complete order information.

1.7 PRE-BID SUBMITTAL REQUIREMENTS

A. Approved Product: Lighting Design is based on a timed power adjustment system. All manufacturers that wish to be considered for METHOD #1 must provide a complete submittal package for approval as outlined in Submittal Information at the end of this section at least 10 days prior to bid.

B. Manufacturers wishing to bid a new or emerging technology must provide a complete submittal package for approval as outlined in Submittal Information at the end of this section at least 10 days prior to bid. Special manufacturing to meet the standards of this specification may be required. An addendum will be issued prior to bid listing any other approved lighting manufacturers and designs.

C. Design Approval: The owner / engineer will review pre-bid shop drawings from the manufacturers to ensure compliance to the specification. If the design meets the design requirements of the specifications, a letter will be issued to the manufacturer indicating approval for the specific design submitted.

PART 2 – PRODUCT

2.1 LIGHTING SYSTEM CONSTRUCTION

A. System Description: Lighting system shall consist of the following:

1. Fixtures to illuminate the fields to the aforementioned light levels. All luminaires shall be constructed with a die-cast aluminum housing or external hail shroud to protect the luminaire reflector system.
2. Galvanized steel poles.
3. Pre-stressed concrete base embedded in concrete backfill allowed to cure for 12-24 hours before pole stress is applied. Alternate may be an anchor bolt foundation designed such that the steel pole and any exposed steel portion of the foundation is located a minimum of 18 inches above final grade. The concrete for anchor bolt foundations shall be allowed to cure for a minimum of 28 days before the pole stress is applied.
4. Round spun concrete poles will be an acceptable alternate, Square static cast poles will not be accepted.
5. Direct bury steel poles (any portion of steel pole below grade) will not be accepted.
6. Manufacturer will remote all ballasts and supporting electrical equipment in aluminum enclosures mounted approximately 10’ above grade. The enclosures shall include ballast, capacitor and fusing for each luminaire. Safety disconnect per circuit for each pole structure will be located in the enclosure.
7. Tubular galvanized steel crossarms only – Angle iron crossarms are not acceptable.
8. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.
9. No exposed wiring allowed; SO cords or exposed gasketing are allowed.
10. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, ballast and other enclosures shall be factory assembled, aimed, wired and tested.
11. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed steel shall be hot dip galvanized per ASTM A123. All exposed hardware and fasteners shall be stainless steel of at least 18-8 grade, passivated and polymer coated to prevent possible galvanic corrosion to adjoining metals. Pole mounting hardware to attach crossarms shall be hot-dip galvanized per ASTM 153. All exposed aluminum shall be powder coated with high performance polyester. All exterior reflective inserts shall be anodized, coated with a clear, high gloss, durable fluorocarbon, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All wiring shall be enclosed within the crossarms, pole, conduit or electrical components enclosure.
12. Lightning Protection: Manufacturer shall supply and equip all structures with lightning protection meeting NFPA 780 standards. Manufacturer shall integrate the required grounding electrode into the structure. If grounding is *NOT* integrated into the structure, the manufacturer shall supply an electrode of not less than 5/8-inch diameter and 8-foot length, installed with a minimum of 10 feet embedment.

Grounding electrode shall be connected to the structure by a grounding electrode with a minimum size of 2 AWG for poles with less than 75' mounting height and 2/0 AWG for poles with more than 75' mounting height.

13. Safety: All system components shall be UL Listed for the appropriate application.
14. Surge Protection: Appropriate surge protection for the line and load side of the sports lighting
    I. Surge protection must be provided in the ballast enclosure of each pole
    II. Surge protection must be provided inside the contactor cabinet on both the pole side and the line side for protection
15. Electrical:
    i. Install New Contactor Cabinets as described earlier in this section.
    ii. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.
16. An hour meter must be provided for each field to record hours of usage. This must operate independently of the control and monitoring system.

2.2 CONTROLS

A. System Description: Controls shall consist of the following:

1. Controls and Monitoring Cabinet to provide on-off control and monitoring of the lighting system, constructed of NEMA Type 4 aluminum. Communication method shall be provided by manufacturer. Cabinet shall contain custom configured contactor modules for 30, 60, and 100 amps, labeled to match field diagrams and electrical design. Manual Off-On-Auto selector switches shall be provided.
2. Contractor shall install control/contractor cabinet to be supplied by manufacturer to the existing service panel. Contactors/Controls require 120V feed. Contractor to verify availability. If not available, a step-down transformer shall be supplied by Contractor.
3. Remote Lighting Control System: System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain the communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.
4. The owner may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields, to only having permission to execute "early off" commands by phone.
5. Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.

6. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The manufacturer shall notify the owner of outages within 24 hours, or the next business day. The controller shall determine switch position and contactor status.
    i. Bidder shall provide 5 sports lighting references where lamp outage monitoring is being done.
7. Communication Costs: Manufacturer shall include communication costs for operating the controls and monitoring system for the length of the warranty.

PART 3 – EXECUTION

3.1 FIELD QUALITY CONTROL

A. Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Project Engineer, Owner's Representative, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA RP-6-01, Appendix B.

B. Correcting Non-Conformance: If, in the opinion of the Owner or his appointed Representative, the actual performance levels including footcandles, uniformity ratios, and maximum kilowatt consumptions are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer shall be liable to any or all of the following:

1. Manufacturer shall at his expense provide and install any necessary additional fixtures to meet the minimum lighting standards. The Manufacturer shall also either replace the existing poles to meet the new wind load (EPA) requirements or verify by certification by a licensed structural engineer that the existing poles will withstand the additional wind load.

2. Manufacturer shall minimize the Owner's additional long term fixture maintenance and energy consumption costs created by the additional fixtures by reimbursing the Owner the amount of $3,000.00 (three thousand dollars) for each additional fixture required.

3. Manufacturer shall remove the entire unacceptable lighting system and install a new lighting system to meet the specifications.

3.2 FIELD LIGHT LEVEL ACCOUNTABILITY

A. Light levels are guaranteed not to fall below the target maintained light levels for the entire warrantee period of 25 Years.

B. Initial light test certification at project completion shall be conducted by a third party State of Florida Electrical Engineer (P.E.). In addition, a third party State of Florida Electrical Engineer (P.E.) shall conduct annual light tests on at least 30% of the fields to be selected by the owner for the following 2 years. Manufacturer shall perform light tests on 30% of the fields, selected by the owner, for an additional 3 years totaling 5 years of light test verification. The manufacturer will be held responsible for any and all changes needed to bring these fields back to compliance for light levels and uniformities. Manufacturer will be held responsible for any damage to the fields during these repairs.

C. If the owner feels that light levels have fallen below the target maintained value identified in the specification at any time during the warrantee period, the Owner may request Manufacturer to conduct a full grid light test to verify compliance to specification. If results are found to meet specified levels, the Owner shall pay Manufacturer up to $100 for conducting the light test. If light levels do not meet the target maintained value identified in the specification, Manufacture shall be required to resolve the problem and bring light levels to the target maintained value identified in the specification within 2 weeks.

Pre-Bid Required Submittal Information

All items listed below are mandatory, shall comply with the specification and be submitted 10 days prior to bid.

1) Table of Contents - Listing of all information being submitted must be included on the table of contents. List the name of the manufacturer's local representative and his/her phone number. **Signed submittal checklist to be included.**

2) Lighting design drawing(s) showing:
   a. Field Name, date, file number, prepared by, and other pertinent data
   b. Outline of field(s) being lighted, as well as pole locations referenced to the center of the field (x & y), or homeplate for baseball/softball fields. Illuminance levels at grid spacing specified
   c. Pole height, number of fixtures per pole, as well as luminaire information including wattage, lumens and optics
   d. Height of meter above field surface
   e. Summary table showing the number and spacing of grid points; average, minimum and maximum illuminance levels in foot candles (fc); uniformity including maximum to minimum ratio, coefficient of variance and uniformity gradient; number of luminaries, total kilowatts, average tilt factor; light loss factor.
   f. If bidding technology other than timed power adjustments, manufacturers shall provide both initial and maintained light scans.
   g. If the manufacturer desires to use a maintenance factor other than specified in section 1.2,, B, Independent field test report from licensed professional engineer will be required to substantiate the ability to maintain light levels in accordance with section 1.7-A of the specification. Both initial and maintained light scans must still be provided. Independent Engineer conducting the report must have no affiliation with the manufacturer and report must be based on actual testing data. Testing must be done on the system as a whole, not on individual components.
   h. Lamp cut sheet from the fixture manufacturer.
   i. Photometric (ITL) reports must be provided to demonstrate the fixtures ability to achieve the specified performance. Reports shall be certified by a qualified independent testing laboratory with a minimum of five years experience or by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. ITL reports will remain confidential and be returned to the manufacturer after the bid is awarded.
   j. Lighting design drawings showing spill light levels in footcandles as specified in section 1.3 A.

3) Luminaire Aiming Summary - Document showing each luminaire's aiming angle and the poles on which the luminaries are mounted. Each aiming point shall identify the type of luminaire.

4) Control and Monitoring - Manufacturer shall provide written definition and schematics for automated control system to include monitoring. They will also provide examples of system reporting and access for numbers for personal contact to operate the system. Manufacturer must also disclose any monitoring costs for 25 years and who is responsible for monitoring. If the manufacturer is not the monitoring agent, information on the company responsible for monitoring must be provided.

5) Electrical Distribution Plans - If bidding an alternate system, manufacturer must include a revised electrical distribution plan including changes to service entrance, panels and wire sizing, signed by a licensed Electrical Engineer in the state of Florida.

6) Warranty - Provide written warranty information including all terms and conditions.

7) Project References - Manufacturer to provide a list of project references of similar products completed within the past three years. **List must be of projects using the exact technology being proposed for this project**

8) Product Information - Complete set of product brochures for all components, including a complete parts list and UL Listings.

9) Non-Compliance - Manufacturer shall list all items that do not comply with the specifications.

10) Compliance - Manufacturer shall sign off that all requirements of the specifications have been met at that the manufacturer will be responsible for any future costs incurred to bring their equipment into compliance for all items not meeting specifications and not listed in item N – Non-Compliance.

Manufacturer: _____ **Signature:** _____

Contact Name: _____ **Date:** _____/_____/_____