****

IFB NO. Y15-711-SB

INVITATION FOR BIDS
FOR
BARNETT PARK SOCCER FIELD

****

PART H
TECHNICAL SPECIFICATIONS

VOLUME II

TECHNICAL PROVISIONS

FOR

NEW SOCCER FIELD
AT BARNETT PARK

ORANGE COUNTY, FLORIDA

ORANGE COUNTY
CAPITAL PROJECTS DIVISION
400 E. SOUTH STREET
ORLANDO, FL 32801

PREPARED BY:

CPWG
CRIBB PHILBECK WEAVER GROUP
2215 Wembley Place
Oviedo, Florida 32765
p 407.267-8905

BID DOCUMENTS
August 2014

TABLE OF CONTENTS

DIVISION 3 – CONCRETE

DIVISION 16 – ELETRICAL

INDEX OF DRAWINGS

(Prepared by CPWG)

Sheet		Description
		New Soccer Field at Barnett Park
1		Cover Sheet
2		General Notes
3		Site Improvement & Demolition Plan
4		Site Improvement & Demolition Plan
5		Limits of Milling & Resurfacing
6		General Details
7		ADS Details
L1		Landscape Plan
L2		Landscape Plan
L3		Irrigation Plan
L4		Irrigation Details
E-1S		Soccer Field Electrical Plan
E-2S		One Line Diagram & Feeder Schedule
M-1		Illumination Summary
M-2		Equipment Layout

SECTION 01001 - PROJECT DIRECTORY

Civil:	CPWG, Inc. 2215 Wembley Place Oviedo, Florida 32765 (407) 267-8905 Jeff.earhart@cpwgengineering.com
Electrical/Mechanical	TLC Engineering for Architecture 874 Dixon Boulevard Cocoa, Florida 32922 (321) 636-0274 Stephen.cotton@tlc-eng.com

END SECTION - 01001

SECTON 01005-ADMINISTRATIVE PROVISIONS

PART I GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. Work of this Contract comprises site work, dewatering operations, road work, utilities, grading, paving, drainage, ditches, ponds, irrigation, sports lighting, demolition and related construction work to produce a complete and functional NEW SOCCER FIELD AT BARNETT PARK including but not limited to new soccer field with lighting, irrigation system, updated parking lot, site work, underground utilities, paving, concrete, excavation, compacting, and landscaping/irrigation for the construction of the NEW SOCCER FIELD AT BARNETT PARK.

1.02 CONTRACT METHOD

A. Construct the work under a single lump sum contract (or as otherwise defined in bid documents).

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, plumbing, systems 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 facility maintenance and for future 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 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.

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 and if no date is specified, use the latest edition.

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

Performance of all tasks specified in the contract documents shall be the responsibility of the contractor unless specified otherwise. The description of the project is as follows: a 330-ft x 225-ft soccer field, regrading a portion of the existing football field, underdrains, stormwater drainage sports lighting, parking lot improvements – milling and resurface and limit new asphalt areas, sidewalks, irrigation, excavation, sodding, road work, utilities, site work, drainage, paving and landscape/irrigation complete.

The project has two deductive alternates as discussed below.

Alternative 1 – Deduct for Hydroseeding
The base bid is to include all non-field areas to be sodded with Bahia sod. Alternative 1 is to hydroseed that portion of the site identified on the landscape plan Sheet L1 as allowing hydroseeding.

Alternative 2 – Deduct for Electrical Work and MUSCO Lighting
The MUSCO light poles, MUSCO light fixtures, and the associated controllers are to be removed from the project if alternative 2 is implemented. The conduit running from the electrical panel to the light poles is to be installed and is not part of this deductive alternate. The conduit ends should be capped and marked with metal caps so they can be easily found in the future. The wire inside of these conduits is not being installed. Electrical needs and the controller for the irrigation system are still included and are not being removed by this alternate. The electrical system is shown on Sheet E-1S.

1.03 WORK UNDER OTHER CONTRACTS

A. Separate contracts may be issued to perform certain construction operations at the site.

1.04 BUILDING/SITE SECURITY

A. The site shall be secured by the General Contractor from unwarranted entry at the end of each day.

B. The construction site shall be secured by means of a construction fence, located around the entire perimeter of the construction site. This construction fence shall

be required to be secure from unwarranted entry at the end of each day.

1.05 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 Contractors use of the premises is limited only by the Owners right to perform construction operations with the own forces or to employ separate contractors on portions of the project.

B. General: Limit 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.

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

1.06 DISTRIBUTION OF RELATED DOCUMENTS

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

1.07 CONTRACT DOCUMENT FILE

A. Copies of the Contract Documents, Plans, Specifications, Addenda, Change Orders, Architects Supplemental Instructions, approved Shop Drawings, Substitution Approvals, etc. shall be placed and maintained in the Contractors field office at the project site by the Contractor throughout the entire contract period. Said these documents shall be filed in a manner that allows for ease of retrieval. Documents shall be made available to the Architect/Engineer and the County’s representatives throughout this same period.

PART 2 PRODUCTS

2.01 ASBESTOS FREE MATERIAL

A. Contractor shall provide a written and notarized statement on company letterhead(s) to certify and warrant that ONLY ASBESTOS FREE MATERIALS AND PRODUCTS were provided as required in this section. 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 on 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 – Project Meetings.

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 2.5% 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.
   m. Include line item for closeout documents.

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:

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 is 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 five (5) original executed copies of each Application for Payment to the Project Manager by means ensuring receipt within 24 hours; 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
8. Project requiring badging, provide sworn notarized statement and signed submittal (by owner) that badges have been returned
9. Current Insurance Certificate
10. If Davis Bacon, final Certified Payroll

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.
e. Pricing not received within 15 days shall be considered a zero cost item.

B. Contractor-Initiated Change Order Proposal Requests: When latent or other unforeseen conditions in mutual accord with the Owner Representative□s 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. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

4. 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.

5. Contractor and subcontractors will provide a complete detailed labor and material breakdown to justify change order request amounts.
6. Contractor shall submit pricing within 15 calendar days of the condition causing the change. If the change is the result of an RFI this pricing shall be submitted within 15 calendar days of the response date. Failure to do so will result in a zero cost change order.
7. If the change is a result of an ASI (Architects Supplemental Instruction) pricing shall be submitted by the contractor within 15 calendar days of the issued date of the ASI. Failure to do so will result in a zero cost change order.

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.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 01035

SECTION 01040-PROJECT COORDINATION

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. Preconstruction meetings, Progress meetings, Coordination meetings and Pre-installation conferences are included in Section 01200 'Project Meetings'.

C. Requirements for the Contractor' 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 Appropriate Mechanical and Electrical Specifications for specific coordination drawing requirements for mechanical and electrical installations.

B. Staff Names: At the Preconstruction Conference submit a list of the Contractor's 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 PROCUREMENT

A. Contractor shall have all subcontractors under contract within 60 days of execution of contract with owner

3.02 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, put request in writing and refer to the Architect/Project Manager for final decision.

3.03 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

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 the appropriate Mechanical and Electrical -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 building's 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 Owner to proceed with cutting and patching does not waive the Owner's 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 as noted in Specifications.

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. Refer to Mechanical and Electrical Divisions regarding Fire Rated Penetrations.

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 as noted in specifications
m. Elevators and elevator equipment

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Designer's and or Owner's opinion, reduce the building's 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.

2. In an occupied Building, any items which may result in a flammable combustible reaction shall have a designated firewatch.

3.

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 during cutting and patching operations.

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 installer's 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. Use wet cutting methods unless not possible.

4. Comply with requirements of applicable Specification Sections 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 -01070 ABBREVIATIONS

PART 1 GENERAL

A. General:

A	Area Square Feet; Ampere
AAMA	Architectural Minimum Manufacturer's Association
ABS	Acrylonitrile Butadiene Styrene
A.C.	Alternating Current; Air conditioning; Plywood Grade A & C
A.B.	Anchor Belt
A.C.I.	American Concrete Institute
Acous.	Acoustical
AD	Plywood, Grade A & D
A.D.	Area Drain
Adh.	Adhesive
Addit	Additional
Adj.	Adjustable
af	Audio-frequency
Aff	Above Finished Floor
Afg	Above Finished Grade
A.G.A.	American Gas Association
Agg.	Aggregate
A.H.	Ampere Hours
A hr.	Ampere-hour
A.H.U.	Air Handing Unit
A.I.A.	American Institute of Architects
A.I.C.	Alternating Interrupting Capacity
AIC	Ampere Interrupting Capacity
AISC	American Institute of Steel Construction
Allow.	Allowance
ALT.	Alternate
Alt.	Altitude
Alum.	Aluminum
a.m.	Ante Meridiem
Amp.	Ampere
Anc.	Anchor
Anod.	Anodized
ANSCI	American National Standards Institute
A.P.	Access Panel
Appd.	Approved
Approx.	Approximately
Apt.	Apartment

Arch.	Architectural
Asb.	Asbestos
A.S.B.C.	American Standard Building Code
A.S.H.R.A.E.	American Society of Heating, Refrig. & AC Engineers
A.S.M.E.	American Society of Mechanical Engineers
A.S.T.M.	American Society for Testing and Materials
Attchmt.	Attachment
Auto.	Automatic
Avg.	Average
A.W.G.	American Wire Gauge
AWI	American Wood Institute
AWS	American Welding Society
Bbl.	Barrel
B.C.	Bare Copper
B.& B.	Grade B. and Better;Balled and Burlapped
B.& S.	Bell and Spigot
B.& W.	Black and White
b.c.c.	Body-centered Cubic
Bd	Board
BE	Bevel End
B.F.	Board Feet
BF.	Bottom Face
Bg. Cem	Bag of Cement
BHP	Boiler Horsepower, Brake Horsepower
B.I.	Black Iron
Bit. ;Bitum	Bituminous
Bk.	Backed
Bkrs.	Breakers
Bldg.	Building
Blk.	Block
Blkg.	Blocking
Bm.	Beam
B.M.	Benchmark
B.O.C.	Bottom of Curb
BOT.	Bottom
Boil.	Boilermaker
B.P.M.	Blows Per Minute
BR	Bedroom
Brg.	Bearing
Brhe.	Bricklayer Helper
Bric.	Bricklayer
Brk.	Brick
Brkt.	Bracket
Brng.	Bearing
Brs.	Brass
Brz.	Bronze

Bsmt.	Basement
Bsn.	Basin
Btr.	Better
BTU	British Thermal Unit
BTUH	BTU per hour
Btwn.	Between
B.U.R.	Built up Roofing
BX	Interlocked Armored Cable
c	Conductivity
C	Hundred; Centigrade
C.	Course
C/C	Center to Center
Cab.	Cabinet
Cair.	Air Tool Laborer
Calc.	Calculated
Cap.	Capacity
Carp.	Carpenter
C.B.	Circuit Breaker
C.BD.	Chalk Board
C.C.A.	Chromate Copper Arsenate
C.C.F.	Hundred Cubic Feet
cd	Candela
cd/sf	Candela per Square Feet
CD	Grade of Plywood Face & Back
CDX	Plywood, grade C & D, exterior glue
Cefi.	Cement Finisher
Cem.	Cement
Cer.	Ceramic
CF	Hundred Feet
C.F.	Cubic Feet
CFM	Cubic Feet per Minute
c.g.	Center of Gravity
CG	Corner Guard
CHW	Chilled Water
C.I.	Cast Iron
C.I.P.	Cast in Place
Circ.	Circuit
C.J.	Control Unit
C.L.	Carload Lot
Clab.	Common Laborer
Clec.	Clock Equipment Cabinet
C.L.F.	Hundred Linear Feet
CLF	Current Limiting Fuse
Clg.	Ceiling
Clkg.	Caulking
Clo.	Closed
CLP	Cross Linked Polyethylene

Clr.	Clear
cm	Centimeter
CMP	Corr. Metal Pipe
C.M.U.	Concrete Masonry Unit
Cntr.	Counter
C.O.	Cleanout
Col.	Column
Conn.	Connection
Cont.	Continuous
Cont.	Contractor
C.Opng.	Cased Opening
CO2	Carbon Dioxide
Comb.	Combination
Compr.	Compressor
Conc.	Continuous; Continued
Cond.	Conductor
Corr.	Corrugated
Cos	Cosine
Cot	Cotangent
Cov.	Cover
CPA	Control Point Adjustment
Cplg.	Coupling
C.P.M.	Critical Path Method
CPVC	Chlorinated Polyvinyl Chloride
C.Pr.	Hundred Pair
CRC	Cold Rolled Channel
Creos.	Creosote
Crpt.	Carpet & Linoleum Layer
CRT	Cathode Ray Tube
CS	Carbon Steel
Csc	Cosecant
C.S.F.	Hundred Square Feet
CSI	Construction Specifications Institute
C.T.	Current Transformer
CTS	Copper Tube Size
Cu	Cubic
Cu. Ft.	Cubic Foot
cw	Continuous Wave
C.W.	Cool White; Cold Water
C. Wall	Curtain Wall
Cwt.	100 Pounds
C.W.X.	Cool White Deluxe
C.Y.	Cubic Yard (27 cubic feet)
C.Y./Hr.	Cubic Yard per Hour
Cyl.	Cylinder
d	Penny (nail size)
D	Deep; Depth; Discharge

Dis; Disch	Discharge
Db.	Decibel
Dbl.	Double
DC	Direct Current
Demob.	Demobilization
d.f.u.	Drainage Fixture Units
D.H.	Double Hang
DHU	Domestic Hot Water
Diag.	Diagonal
Diam.	Diameter
Distrib.	Distribution
Dk.	Deck
D.L.	Deck Load
Do.	Ditto
Dp.	Depth
D.P.S.T.	Double Pole, Single Throw
Dr.	Driver
Drink.	Drinking
D.S.	Double Strength
D.S.A.	Double Strength A Grade
D.S.B.	Double Strength B Grade
Dty.	Duty
DWV	Drain Waste Vent
DX	Deluxe White, Direct Expansion
dyn	Dynbe
e	Eccentricity
E	Equipment only; East
Ea	Each
E.B.	Encased Burial
Econ.	Economy
EDP	Electronic Data Processing
E.D.R.	Equiv. Direct Radiation
Eq.	Equation
Elec.	Electrician; Electrical
Elev.	Elevator; Elevating
EMT	Electrical Metallic Conduit; Thin Wall Conduit
Eng.	Engine
EPDM	Ethylene Propylene Diene Monomer
Eqhv.	Equip. Oper., heavy
Eqlt.	Equip. Oper., light
Eqmd.	Equip. Oper., medium
Eqmm.	Equip. Oper., Master Mechanic
Equol.	Equip. Oper., Oilers
ERW	Electric Resistance Welded
Est.	Estimated
esu	Electrostatic Units
E.W.	Each Way

EWT	Entering Water Temperature
Excav.	Excavation
Exp.	Expansion, Exposure
Ext.	Exterior
Extru.	Extrusion
f.	Fiber Stress
F	Fahrenheit; Female; Fill
Fab.	Fabricated
F.B.C.	Florida Building Code
FBGS	Fiberglass
F.C.	Foot candles
f.c.c.	Face Centered Cubic
f'c	Compressive Stress in Concrete; Extreme Compressive Stress
F.E.	Front End
FRP	Fluorinated Ethylene Propylene (Teflon)
F.G.	Flat Grain
F.H.A.	Federal Housing Administration
Fig.	Figure
Fin	Finished
Fixt.	Fixture
Fl. Oz.	Fluid Ounces
Flr.	Floor
F.M.	Frequency Modulation; Factory Mutual
Fmg.	Framing
Fndtn.	Foundation
Fori.	Foreman; Inside
Fount.	Fountain
FPM	Feet Per Minute
Fr.	Frame
F.R.	Fire Rating
FRK	Foil Reinforced Kraft
FRP	Fiberglass Reinforced Plastic
FS	Forged Steel
FSC	Cast Body; Cast Switch Box
Ft.	Foot; Feet
Ftng.	Fitting
Ftg.	Footing
Ft.Lb.	Foot Pound
Furn.	Furniture
FVNR	Full Voltage Non-Reversing
FXM	Female by Male
Fy.	Minimum Yield Stress of Steel
g	Gram
G	Gauss
Ga.	Gauge
Gal.	Gallon

Gal./Min.	Gallon Per Minute
Galv.	Galvanized
Gen.	General
G.F.I.	Ground Fault Interrupter
Glaz.	Glazier
GPD	Gallons per Day
GPH	Gallons per Hour
GPM	Gallons per Minute
GR	Grade
Gran.	Granular
Grnd.	Ground
H	High; High Strength Bar Joist; Henry
H.C.	High Capacity
H.D.	Heavy Duty; High Density
H.D.O.	High Density Overlaid
Hdr.	Header
Hdwe.	Hardware
Help.	Helper Average
HEPA	High Efficiency Particular Air Filter
Hg.	Mercury
HIC	High Interrupting Capacity
H.O.	High Output
Horiz.	Horizontal
H.P.	Horsepower; High Pressure
H.P.F.	High Power Factor
Hr.	Hour
Hrs./Day	Hours per Day
HSC	High Short Circuit
Ht.	Height
Htg.	Heating
Htrs.	Heaters
HVAC	Heating, Ventilating & Air Conditioning
Hvy.	Heavy
HW	Hot Water
Hyd.;Hydr.	Hydraulic
Hz.	Hertz (cycles)
I.	Moment of Inertia
I.C.	Interrupting Capacity
ID	Inside Diameter
I.D.	Inside Dimension; Identification
I.F.	Inside Frosted
I.M.C.	Intermediate Metal Conduit
In.	Inch
Incan.	Incandescent
Incl.	Included; Including
Int.	Interior
Inst.	Installation

Insul.	Insulation
I.P.	Iron Pipe
I.P.S.	Iron Pipe Size
I.P.T.	Iron Pipe Threaded
I.W.	Indirect Waste
J	Joule
J.I.C.	Joint Industrial Council
K	Thousand; Thousand Pounds; Heavy Wall Copper Tubing
K.A.H.	Thousand Amp. Hours
KCMIL	Thousand Circular Mils
KD	Knock Down
K.D.A.T.	Kiln Dried After Treatment
Kg	Kilogram
kG	Kilogauss
kgf	Kilogram force
kHz	Kilohertz
Kip	1000 Pounds
KJ	Kiljoule
K.L.	Effective Length Factor
Km	Kilometer
K.L.F.	Kips per Linear Foot
K.S.F.	Kips per Square Feet
K.S.I.	Kips per Square Inch
K.V.	Kilovolt
K.V.A	Kilovolt Ampere
K.V.A.R.	Kilovolt (Reactance)
KW	Kilowatt
KWh	Kilowatt-hour
L	Labor only; Length; Long; Medium Wall Copper Tubing
La.	Labor
lat	Latitude
Lath.	Lather
Lav.	Lavatory
lb,;#	Pound
L.B.	Load Bearing; L Conduit Body
L. & E.	Labor & Equipment
lb./hr.	Pounds per Hour
lb./L.F.	Pounds Per Linear Foot
L.C.L.	Less than Carload Lot
Ld.	Load
LE	Lead Equivalent
L.F.	Linear Foot
Lg.	Long; Length; Large
L. & H.	Light and Heat
L.H.	Long Span high Strength Bar Joist

L.J.	Long Span Standard Strength Bar Joist
L.L.	Live Load
L.L.D.	Lamp Lumen Depreciation
lm	Lumen
lm/sf	Lumen per Square Feet
lm/W	Lumen per Wall
L.O.A.	Length Over All
log	Logarithm
L.P.	Liquified Petroleum; Low Pressure
L.P.F.	Low Power Factor
L.R.	Long Radius
L.S.	Lump Sum
Lt.	Light
Lt.Ga	Light Gauge
L.T.L.	Less than Truckload Lot
Lt. Wt.	Lightweight
L.V.	Low Voltage
M	Thousand; Material; Male; Light Wall Copper Tubing
m/hr; M.H.	Man Hour
mA	Milliampere
Mach	Machine
Mag. Str.	Magnetic Starter
Maint.	Maintenance
Marb.	Marble Setter
Mat. Mat'l	Material
Max	Maximum
MBF	Thousand Board Feet
MBH	Thousand BTU's per hr.
MC	Metal Clad Cable
M.C.F.	Thousand Cubic Feet
M.C.F.M.	Thousand Cubic Feet per Minute
M.C.M.	Thousand Circular Mils
M.C.P.	Motor Circuit Protector
MD	Medium Duty
M.D.O.	Medium Density Overlaid
Med.	Medium
MF	Thousand Feet
M.F.B.M.	Thousand Feet Board Measure
Mfg.	Manufacturing
Mfrs.	Manufacturers
mg	Milligram
MGD	Million Gallons per Day
MGPH	Thousand Gallons per Hour
MH:M.H.	Manhole; Metal Halide; Man-Hour
MHz	Megahertz
Mi.	Mile

Ml	Malleable Iron; Mineral Insulated
mm	Millimeter
Mill.	Millwright
Min.;min.	Minimum; minute
Misc.	Miscellaneous
mi	Millimeter
M.L.F.	Thousand Linear Feet
Mo.	Month
Mobil.	Mobilization
Mog.	Mogul Base
MPH	Miles Per Hour
MPT	Male Pipe Thread
MRT	Mile Round Trip
ms	Millisecond
M.S.F.	Thousand Square Feet
Mstz.	Mosaic & Terrazzo Worker
M.S.Y.	Thousand Square Yards
Mtd.	Mounted
Mthe.	Mosaic & Terrazzo Helper
Mult.	Multi; Multiply
M.V.A.	Million Volt Amperes
M.V.A.R.	Million Volt Amperes Reactance
MV	Megavolt
MW	Megawatt
MXM	Male by Male
MYD	Thousand Yards
N	Natural; North
nA	Nanoampere
NA	Not Available; Not applicable
N.B.C.	National Building Code
NC	Normally Closed
N.F.M.A.	National Electrical Manufacturers Association
NEHB	Bolted Circuit Breaker to 600V
N.L.B.	Non-Load-Bearing
NM	Non-Metallic Cable
nm	Nanometer
No.	Number
N.O.C.	Not Otherwise Classified
Nose.	Nosing
N.P.T.	National Pipe Thread
NQOB	Bolted Circuit Breaker to 240V
N.R.C.	Noise Reduction Coefficient
N.R.S.	Non Rising Stem
ns	Nanosecond
nW	Nanowatt
OB	Opposing Blade

OC	On Center
OD	Outside Diameter
O.D.	Outside Dimension
ODS	Overhead Distribution System
O & P	Overhead and Profits
Oper.	Operator
Opng.	Opening
Orna.	Ornamental
O.S. & Y.	Outside Screw and Yoke
Ovhd.	Overhead
OWG	Oil, Water or Gas
Oz.	Ounce
P.	Pole; Applied Load; Projection
p.	Page
Pape.	Paperhanger
P.A.P.R.	Powered Air Purifying Respirator
PAR	Weatherproof Reflector
Pc.	Piece
P.C.	Portland Cement; Power Connector
P.C.M.	Phase Contract Microscopy
P.C.F.	Pounds Per Cubic Feet
P.E.	Professional Engineer; Porcelain Enamel; Polyethylene; Plain End
Perf.	Perforated
Ph.	Phase
P.I.	Pressure Injected
Pile.	Pile Driver
pkg.	Package
Pl.	Plate
Plah.	Plaster Helper
Plas.	Plasterer
Pluh.	Plumbers Helper
Plum.	Plumber
Ply.	Plywood
p.m.	Post Meridiem
Pord.	Painter Ordinary
pp	Pages
PP;PPL	Polypropylene
P.P.M.	Parts per Million
Pr.	Pair
Prefab.	Prefabricated
Prefin.	Prefinished
Prop.	Propelled
PSF;psf	Pounds per Square Foot
PSI;psi	Pounds per Square Inch
PSIG	Pounds per Square Inch Gauge
PSP	Plastic Sever Pipe

Pspr.	Painter, Spray	
Psst.	Painter, Structural Steel	
P.T.	Potential Transformer	
P. & T.	Pressure & Temperature	
Ptd.	Painted	
Ptns.	Partitions	
Pu	Ultimate Load	
PVC	Polyvinyl Chloride	
Pvmt.	Pavement	
Pwr.	Power	
Q	Quantity Heat Flow	
Quan.; Qty	Quantity	
Q.C.	Quick Coupling	
r	Radius of Gyration	
R	Resistance	
R.C.P.	Reinforced Concrete Pipe	
Rect.	Rectangle	
Reinf.	Reinforced	
Req'd	Required	
Res.	Resistant	
Resi	Residential	
Rgh.	Rough	
R.H.W.	Rubber, Heat & Water Resistant;	Residential Hot Water
rms	Root Mean Square	
Rnd.	Round	
Rodm.	Rodman	
Rofc.	Roofer, Composition	
Rofp.	Roofer, Prcast	
Rohe.	Roofer Helpers (Composition)	
Rots.	Roofer, Tile & Sale	
R.O.W.	Right of Way	
RPM	Revolutions per Minute	
R.R.	Direct Burial Feeder Conduit	
R.S.	Rapid Start	
R.T.	Round Trip	
S.	Suction; Single Entrance; South	
Scaf.	Scaffold	
Sch.;Sched.	Schedule	
S.C.R.	Modular Brick	
S.D.	Sound Deadening	
S.D.R.	Standard Dimension Ratio	
S.E.	Surfaced Edge	
Sel.	Select	
S.E.R.;S.E.U.	Service Entrance Cable	
SF.	Square Foot	
S.F.C.A.	Square Foot Contact Area	

S.F.F.C.M.U.	Split Face Fluted Concrete Masonry Unit.
S.F.G.	Square Foot of Ground
S.F. Hor.	Square Foot Horizontal
S.R.F.	Square Foot of Radiation
S.F.Shlf.	Square Foot of Shelf
S4S	Surface 4 Sides
Shee.	Sheet Metal Worker
Sin.	Sine
Skwk.	Skilled Worker
S.L.	Saran Lined
S.L.	Slimline
Sldr.	Solder
S.N.	Solid Neutral
S.P.	Static Pressure; Single Pole; Self Propelled
Spri.	Sprinkler Installer
Sq.	Square; 100 Square Feet
S.P.D.T.	Single Pole, Double Throw
S.P.S.T.	Single Pole, Single Throw
SPT	Standard Pipe Thread
Sq.Hd.	Square Head
Sq.In.	Square Inch
S.S.	Single Strength; Stainless Steel
S.S.B.	Single Strength B Grade
Sswk.	Structural Steel Worker
Sswl.	Structural Steel Welder
St.;Stl.	Steel
S.T.C.	Sound Transmission Coefficient
Std.	Standard
STP	Standard Temperature & Pressure
Stpi.	Steamfitter, Pipefitter
Str.	Strength; Starter; Straight
Strd.	Stranded
Struct.	Structural
Sty.	Story
Subj.	Subject
Subs.	Subcontractors
Surf.	Surface
Sw.	Switch
Swbd.	Switchboard
S.Y.	Square Yard
Syn.	Synthetic
Sys.	System
t.	Thickness
T	Temperature; Ton
Tan	Tangent
T.C.	Terra Cotta
T & C	Threaded and Coupled

T.D.	Temperature Difference
T.E.M.	Transmission Electron Microscopy
TFE	Tetrafluoroethylene (teflon)
T.& G.	Tongue & Groove; Tar & Gravel
Th.;Thk.	Thick
Thn.	Thin
Thrded.	Threaded
Tilf.	Tile Layer Floor
Tilh.	Tile Layer Helper
THW	Insulated Strand Wire
THWN;THHN	Nylon Jacketed Wire
T.L.	Truckload
Tot.	Total
T.S.	Trigger Start
Tr.	Trade
Transf.	Transformer
Trhv.	Truck Driver, Heavy
Trir.	Trailer
Trit.	Truck Driver, Light
TV	Television
T.W.	Thermoplastic Water Resistant Wire
UCI	Uniform Construction Index
UF	Underground Feeder
U.H.F.	Ultra High Frequency
U.L.	Underwriters Laboratory
Unfin.	Unfinished
URD	Underground Residential Distribution
V	Volt
V.A.	Volt Amperes
V.C.T.	Vinyl Composition Tile
VAV	Variable Air Volume
VC	Veneer Core
Vent.	Ventilating
Vert.	Vertical
V.F.	Vinyl Faced
V.G.	Vertical Grain
V.H.F.	Very High Frequency
VHO	Very High Output
Vib.	Vibrating
V.L.F.	Vertical Linear Foot
Vol.	Volume
W	Wire; Watt; Wide; West
w/	With
W.C.	Water Column; Water Closet
W.F.	Wide Flange
W.G.	Water Gauge
Wldg.	Welding

W. Mile	Wire Mile
W.R.	Water Resistant
Wrck.	Wrecker
W.S.P.	Water Steam, Petroleum
WT, Wt.	Weight
WWF	Welded Wire Fabric
XRMR	Transformer
XHD	Extra Heavy Duty
XHHW;XLPE	Cross Linked Polyethylene Wire Insulation
Y	Wye
yd	Yard
yr	Year
Δ	Delta
%	Percent
Φ	Phase
@	At
<	Less Than
>	Greater Than

PART 2- PRODUCTS:

Not used.

PART 3- EXECUTION:

Not used.

END SECTION 01070

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, approved, required, and permitted mean directed by the Project Manager, requested by the Architect/Project Manager and similar phrases.

D. Accepted: This term ; Accepted, where used in conjunction with the Architects action on the Contractors submittals, applications, and requests, is limited to the Architects 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: testing laboratory is an independent entity engaged to perform specific inspections or tests, either at the Project site 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 Institutes 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.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 01095

SECTION 01200-PROJECT MEETINGS

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 limitations
p. Governing regulations
q. Safety

r. Inspection and testing requirements
s. Required performance results
t. Recording requirements
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. Contractor shall be responsible for the taking of notes and issuance of meeting minutes, and sign-in sheets.

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, in narrative form, or progress since the previous meeting and report.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

(Not Applicable)

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. Contractor's 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 01400 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. Refer to 01631 Product Substitutions.

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 accepting 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 Contractor's 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 precalculated 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 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.

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 Drawings 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 ½” 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 manufacturer□s 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 Installer’s 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 Architect's/Owner's 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 ARCHITECT'S 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.

1. Compliance with specified characteristics is the Contractor's responsibility.

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, or elsewhere where work is in progress.

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.

PART 2 PRODUCTS

(Not Applicable)

PART 3 Execution

(Not Applicable)

END SECTION 01300

SECTION 01380
CONSTRUCTION PHOTOGRAPHS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. General: This Section specifies administrative and procedural requirements for construction photographs.

1.03 SUBMITTALS

A. General: Refer to Division 1 Section Submittals for general requirements for submitting photographs.

B. Prints: Submit 3 prints of each view directly to the Project Manager within 5 days of taking photographs. The Project Manager will distribute prints as follows:

1. One print to the Contractor shall be retained in the field office at the project site and available at all times for reference.

2. One print to the Owner as the Owner's permanent record.

3. One print shall be retained in the Architect's files.

C. Extra Prints: When requested by the Architect, the photographer shall submit extra prints of photographs, with distribution directly to designated parties who will pay the costs for the extra prints directly to the photographer.

D. Negatives: Retain the photographic negatives 3 years after date of Substantial Completion. During this period, the photographer shall fill orders by the Architect for extra prints. Extra prints shall be priced at prevailing local commercial prices.

1.04 QUALITY ASSURANCE

A. Engage a qualified commercial photographer to take photographs during construction.

B. Photographer's Qualifications: Photographer shall be a firm or an individual of established reputation who has been regularly engaged as a professional photographer for not less than 3 years.

C. Associated Services: Cooperate with the photographer's work. Provide reasonable auxiliary services as requested, including access and use of temporary facilities including temporary lighting.

PART 2 PRODUCTS

2.01 PHOTOGRAPHIC COPIES

A. Provide 8" x 10" smooth surface gloss color prints on single-weight commercial-grade stock, mounted on muslin. Allow a 1" wide margin punched for standard 3-ring binder. Place margin on the left edge for vertical shots and at the top for horizontal shots.

B. Identification: Label each photograph on the front in the bottom margin with project name and date the photograph was taken. On the back of each print provide an applied label or rubber stamped impression with the following information:

1. Name of the Project
2. Name and address of the photographer
3. Name of the Architect
4. Name of the Contractor
5. Date the photograph was taken
6. Architect's Project No.

C. Description of vantage point, in terms of location, direction (by compass point), and evaluation of story on construction.

PART 3 EXECUTION

3.01 PHOTOGRAPHIC REQUIREMENTS

A. Take three (3) color project photographs at monthly intervals, coinciding with the cutoff date associated with each Application for Payment. The photographer shall select the vantage points for each shot each month to best show the status of construction and progress since the last photographs were taken.

B. Additional Photographs: From time to time the Architect may issue requests for

additional photographs, in addition to periodic photographs specified. Additional photographs will be paid for by Change Order, and are not included in the Contract Sum or an Allowance.

1. The Architect will give the photographer 3 days notice, where feasible.

2. In emergency situations, the photographer shall take additional photographs within 24 hours of the Architect's request.

C. Circumstances that could require additional photographs include, but are not limited to:

1. Substantial Completion of a major phase or component of Work.

2. Owner's request for special publicity photographs.

3. Special events planned at project site.

D. Immediate follow-up when on-site events result in construction damage or losses. Photographs to be taken at fabrication locations away from project site; these are not subject to unit prices or unit-cost allowances. Extra record photographs at time of final acceptance.

E. Construction projects over $1,000,000 shall include at least one of the photographs listed in 3.01.A be aerial.

F. Aerial Photos shall be required from the date of the Notice to Proceed to the date of Final Completion.

END OF SECTION 01380

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: In spections and tests required, and standards for testing.

1.03 REFERENCES

A. ANSI/ASTM D3740 or as required in Sp ecifications Divisions 2-16 - Practice for Evaluation of Agencies Engages in testi ng 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 Agenci es for Concrete, Steel, and Bitum inous Materials as Used in Construction.

1.04 SELECTION AND PAYMENT

A. Owner will em ploy and pay f or 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 requirem ents 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 sam ples 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 laborator y 48 hours prior to expected tim e 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. 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 200 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 03300.

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

7. Visual inspection of all bar joist bearing ends for compliance with specifications.

8. Visual inspection of all metal roof deck structural welds.

END OF SECTION 01410

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 entire perimeter of the construction site. 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. Project 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 becontinuously 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 as 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, one (1) □" I.D. for line posts and two (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 'Asphalt Concrete Paving' or 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 cups 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.

I. 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 01580
PROJECT SIGN

PART 1 GENERAL

1.01 DESCRIPTION

A. Furnish, install and maintain one project identification sign, 48 inches x 96 inches in size. Contractor shall verify maximum allowable job site sign size specifications prior to fabrication of sign. Contractor shall be required to obtain and pay for any and/or all permits and approvals for the erection of said project identification sign. Unless local authorities have different maximum size requirements that would not allow for such size.

B. Content required on sign:

1. Title of project/address of project

2. Name of Owner/name of Orange County chairman and commissioner(s). All names shall be those in office on the date the construction contract is awarded.

3. Tile and names of:

a. Architect of Record
b. General Contractor

C. No other signs or advertising will be permitted on the project site, without approval of County, except signs for safety purposes.

1.02 CODES

A. Where required by Local Code, comply with minimum structural and foundation requirements.

1.03 SUBMITTALS

A. Shop Drawings, showing:

1. Layout, showing sizes and styles of letters

2. Type of paint.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

A. Southern Pine No. 2 pressure treated, AWPB LP-2. Surfaced four sides.

B. Plywood: A-C EXT MDO APA PSI, with medium density overlay, 3/4" thick.

C. Nails: Hot-dip galvanized

D. Paint: Manufactured by Sherwin-Williams or equal

1. Primer: A-100 Ext. Wood Primer Y24W20

2. Second, and third coats: Industrial Enamel B54(S-W)

E. Sign Colors: Refer to project sign drawing attached herein.

2.02 LETTERING

A. All Lettering shall be Times Roman Bold Style

PART 3 EXECUTION

3.01 INSTALLATION

A. Install members plumb, in true alignment, and in concrete foundations by Local Code.

B. Securely attach framing members to each other and to foundations.

3.02 PAINT

A. Paint all exposed surfaces of sign and support construction.

3.03 REMOVAL

A. Remove sign, framing and foundations no later than date of Final Completion.

3.04 SIGN DETAILS

A. Construct sign in accordance with the attached drawing.

END OF SECTION 01580

8'-0"

4'-0"

LETTER HEIGHT = 4"

LETTER HEIGHT = 1-3/4"

LETTER HEIGHT = 7/8"

NEW SOCCER FIELD AT BARNETT PARK

BOARD OF COUNTY COMMISSIONERS
ORANGE COUNTY FLORIDA

CPWG Logo, address, phone, fax

BOARD OF COUNTY COMMISSIONERS
ORANGE COUNTY, FLORIDA

Orange County Mayor – Richard T. Crotty

BOARD OF COUNTY COMMISSIONERS

District 1 Commissioner – Teresa Jacobs
District 2 Commissioner – Fred Brummer
District 3 Commissioner – Mildred Fernandez
District 4 Commissioner – Linda Stewart
District 5 Commissioner – Bill Segal
District 6 Commissioner – Tiffany Moore

255 S. Orange Avenue
Suite 1600
Orlando, Florida 32801
Phone: 407-841-8050
Fax: 407-425-7267
www.tlc-engineers.com
EB #0000015
ENGINEERING FOR ARCHITECTURE

BOWEN ENGINEERING CORPORATION
1528 VASSAR STREET, ORLANDO, FL. 32804
PH:(407) 423-7585 FAX: 423-4872
FRED BOWEN, FLA. PE#38153
STRUCTURAL ONLY.

S.G.M. ENGINEERING, INC.
651 Outer Road
Orlando, FL. 32814
Tel:(407)767-5186 FAX:(407)767-5772
www.sgmengineering.com

SGM Project Number:27122

LANDSCAPE ARCHITECTS
SITE PLANNERS AND
LANDSCAPE ARCHITECTS
605 Delaney Ave. · Orlando, Florida 32801
Telephone (407) 426-0654 · Fax (407) 426-0655
License LC000212 · Incorporated 1983

WBQ Design & Engineering, Inc.

Most current Board of County Commisioners

No subconsultants

NEW SOCCER FIELD AT BARNETT PARK

0 2" 6" 12" 24"

1 1/2" = 1'-0"

PROJ. NO.	0757
DRAWN BY	SS/RH
CHECKED BY	RH

A1.1

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 Contractors selection of products for use in the Project.

1. Multiple Prime Contracts: Provisions of this Section apply to the construction activities of each prime Contractor.

B. The Contractors Construction Schedule and the Schedule of Submittals are included under Section 01300 Submittals.

C. Standards: Refer to Section Definitions and Standards 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 01631 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 manufacturers' product name, including make or model designation, indicated in the manufacturers 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 or 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 manufacturers name and proprietary product names for each item listed.

1. Coordinate the product list schedule with the Contractors 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. Manufacturers name and address
   e. Suppliers name and address
   f. Installers 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 Contractors 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. Architects 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 or products, but does not constitute a waiver of the requirement that products comply with Contract Documents. The Architects 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 manufacturers or producers 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 an 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 manufacturers' 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 manufacturers 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 manufacturers 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 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. Manufacturers recommendations may be contained in published product literature, or by the manufacturers' certification of performance.

5. Compliance with Standards, Codes and Regulations: Where the Specifications only requires 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 Architects 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 manufacturers 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.

END OF SECTION 01600

SECTION 01631-PRODUCTS 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.

E. Contractor shall use the attached Request for Substitution form.

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 and bidding 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 Contractor's 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 substitution's 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, which ever 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.

PART 2 PRODUCTS

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, as determined by the Architect; 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

SUBSTITUTION REQUEST

Date:_____ Substitution Request Number_____

Project:_____

To:_____ From:_____

Specification Title:_____ Description:_____

Section:_____ Page:_____ Article/Paragraph:_____

Specified Manufacturer:_____ Specified Model No:_____

Proposed Substitution:_____

Manufacturer:_____ Model No:_____

Address:_____ Phone No:_____

Installer:_____ Address_____Phone:_____

History: ☐New product ☐2-5 years old ☐5-10 years old ☐More than 10 years old

*Differences between proposed substitution and specified product: _____

_____

_____

☐Point –by-point comparative data attached - REQUIRED BY A/E

---

*Reason for not providing specified item:_____

_____

_____

Similar Installation:

Project:_____ Architect:_____

Address:_____Owner:_____

Date:_____ *Proposed substitution affects other parts of Work: ☐ No ☐ Yes: Explain

_____

_____

Savings to Owner for accepting substitution:_____ ($_____)

Proposed substitution changes Contract Time: ☐No ☐Yes [Add] [Deduct)_____days.

Supporting Data Attached: ☐Drawings ☐Product Data ☐ Samples ☐Tests ☐Reports ☐Other_____

*Attach additional pages as needed

SUBSTITUTION REQUEST (Continued)

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: _____

_____

_____

A/E's REVIEW AND ACTION

☐ Substitution approved – Make submittals in accordance with Specification Section 013300.
☐ Substitution approved as noted – Make submittals in accordance with Specification Section 013300.
☐ Substitution rejected – Use specified materials.
☐ Substitution request received too late – Use specified materials.

Signed by: _____ Date: _____

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E ☐ _____

_____

_____

_____

_____

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.

1.02 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)
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 coincides 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 Project Manager/Consultants and the Owner. Cost will be deducted from the Contractors 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 completed operations where required.

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

3. Submit a certified copy of the Project Managers final inspection list of item 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. Reinspection Procedure: The Project Manager will reinspect 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 Project Manager.

1. Upon completion of reinspection, the Project Manager 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 purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Project Managers reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contractor 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 Owners 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, an 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-Builts Drawings.

C. Record Specifications: Maintain one com plete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders a nd modifications issued in printed form during construction. Mark these docum ents to show substantial variations in actual W ork performed in comparison with the text of the Specifications and m odifications. 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 W ork, submit record Specifications to the Project Manager for the Owners records.

D. Record Project Data: Maintain one copy of each Product Data subm ittal. Mark these docum ents to show significant variation in actual W ork performed in comparison with information submitted. Include variations in products delivered to the site, and from the m anufacturers installation instructions and recommendations. Give particular attention to concealed products and portions of the W ork 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 m ark-up, submit complete set of record Product Data in the three ring bi nder (indexed) to the Project Manager for the Owners records.

E. Record Sample Submitted: Immediately prior to the date or dates of Substantial Completion, the Contractor will m eet at the site with the Project Manager and the Owners personnel to determ ine which of the submitted Samples that have been maintained during progress of the Work are to be transm itted to the Owner f or record purposes. Com ply with delivery to the Owners Sample storage area.

F. Miscellaneous Record Submittals: Ref er to other Specif ication Sections for requirements of miscellaneous record-keeping and subm ittals in connection with actual performance of the Work. Immediately prior to the

date or dates of Substantial Com pletion, complete miscellaneous record and place in good order, properly iden tified and bound or filed, ready for continued use and reference. Subm it to the Project Manager for the Owners records.

G. Maintenance Manuals: Organize operating and m aintenance data into five (5) suitable sets of m anageable size. Bind properly indexed data in individual heavy-duty 2-inc, 3-ring vinyl covered binders, with pocket folders for folded sheet inform ation. 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 Instructi ons: Arrange for each installer of equipment that requires regular m aintenance. If installers are not experienced in procedures, provide instruction by m anufacturers representatives. All items to be provided or completed prior to certificate of Substantial Completion being 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 equipm ent, 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 com mercial quality 8 ½" x 11" three ring binder, indexed with hardback, cleanable, plastic covers.

C. Label cover of each binder w ith typed title PROJECT CLOSE-OUT MANUAL, with title of project; nam e, address, and telephone num ber 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. Manufacturers 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 docum ents for each sec tion listed. List individual docum ents in each section in the table of conten ts, in the sequence of the Table of Contents of the Project Manual.

F. Identify each docum ent listed in the Table of Contents with the num ber and title of the specification section in which specified, and the nam e 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 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 manufacturers 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. Apply floor wax to vinyl floors.
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 Owners 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 Owners property, arrange for disposition of these materials as direct.

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 Contract Documents, including manufacturers standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Contractors 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: Manufacturers 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 do 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 W ork to an acceptable condition com plying with requirements of Contract Documents.

D. Owners Recourse: W ritten warranties made to the Owner are in addition to implied warranties, and shall not lim it the duties, obligation, rights and rem edies otherwise available under the law, nor sh all warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of W arranties: The Own er reserves the right to reject warranties and to lim it selections to products with warranties not in conflict with requirements of the Contract Documents.

E. The Owner reserves the right to refu se to accept W ork for the Project where a special warranty, certification, or sim ilar commitment is required on such W ork or part of the W ork, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.04 WARRANTY PERIOD

A. The Contractor shall participat e with the County and the Architects representative, at the beginning of the tenth month of the warranty period, in conducting an on site review and evaluation of all item s 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, problem s, 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 item s which are determ ined by the County to be incomplete or a non-com ply status at the tim e of Substantial Com pletion. 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 m anufacturers standard for product specified except where specific warranty periods are specifi ed in individual sections. But in no case less than one year.

1.05 SUBMITTALS

A. Submit written warranties to the Owner pr ior to the date certif ied for Substantial Completion. If the Architects Certificat e of Substantial Com pletion 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 (15) 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 execution by the required parties. Submit a draft to the Owner through 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 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" 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 (Not Applicable)

END OF SECTION 01740

SECTION 02010 – SOIL REPORT AND RECOMMENDATIONS

PART 1 - GENERAL

See Attached Report

Geotechnical Engineering Report

Barnett Park Soccer Field
West Colonial Drive
Orange County, Florida

April 29, 2014
PO No. C09906B031
Nodarse / Page One Project No. AK145002

Prepared for:
Orange County Capital Projects Division
Orlando, Florida

Prepared by:
Nodarse / Page One Joint Venture, LLC
Winter Park, Florida

1675 Lee Road, Winter Park, Fl 32789, (407) 740-6110, (407) 740-6112 [fax]

April 29, 2014

Orange County Capital Projects Division
400 East South Street
Orlando, Florida 32801

Attn: Mr. Roan Waterbury
P: [407] 836-0034
F: [407] 836-0051
E: Roan.Waterbury@ocfl.net

Re: Geotechnical Engineering Report
Barnett Park Soccer Field
West Colonial Drive
Orange County, Florida
PO No. C09906B031
Nodarse / Page One Project Number: AK135002

Dear Mr. Waterbury:

Nodarse/Page One Joint Venture, LLC (Nodarse/Page One) has completed the geotechnical engineering services for the above-referenced project. This study was performed in general accordance with our proposal number PAK140004 dated February 4, 2014, authorized by Purchase Order C09906B031.

This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning potential geotechnical earthwork and the design and construction of a restroom building, pavements, and a stormwater pond at the subject site.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Nodarse / Page One Joint Venture, LLC

Shenna McMaster, P.E.
Senior Geotechnical Engineer
Florida PE #57537

Bruce H. Woloshin, P.E.
Principal

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

EXECUTIVE SUMMARY

A geotechnical investigation has been performed for the proposed soccer field improvements at the existing Barnett Park in West Orange County, Florida. Four (4) borings, designated as B-1 through B-4, were performed to depths between 7 and 30 feet below the existing ground surface in the proposed building, stormwater pond, and pavement locations.

Based on the information obtained from our geotechnical exploration, the following geotechnical considerations were identified:

- High organic soils were observed to a depth of about 11 feet in Boring B-1, performed in the anticipated restroom building location. This organic soil is considered unsuitable for support of even lightly loaded structures on shallow foundations. Removal and replacement of this unsuitable material or use of a deep foundation system is recommended for construction of structures in this area. However, we understand that at the time of our exploration, the restroom building has been removed from the project.

- Boring B-2 was performed in the proposed stormwater pond location. High organic soils were observed in this boring location to a depth of 5.5 feet below existing grade. Groundwater was found at a depth of 1 foot below existing grade. Seasonal high groundwater conditions are anticipated to be above the existing ground surface.

- Borings B-3 and B-4, performed in the proposed pavement areas, found fine sand with silt and silty fine sand. Sand with organics was found at various depths within these borings. However, the organic content of these soils are less than 10 percent. Groundwater was not observed in the borings within the 7-foot explored depth. Seasonal high groundwater levels are expected to be 4 to 5 feet below existing grade at these boring locations.

This summary should be used in conjunction with the entire report for preliminary design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of the report limitations.

GEOTECHNICAL ENGINEERING REPORT
BARNETT PARK SOCCER FIELD
WEST COLONIAL DRIVE
ORANGE COUNTY, FLORIDA

Nodarse / Page One Project No. AK145002
April 29, 2014

1.0 INTRODUCTION

A geotechnical investigation has been performed for the proposed soccer field improvements at the existing Barnett Park in West Orange County, Florida as shown on the Topographic Vicinity Map included as Exhibit A-1 in Appendix A. A total of four (4) borings, designated as B-1 through B-4, have been performed to depths ranging from 7 to 30 feet below the existing ground surface throughout the site. Logs of the borings along with a site location plan, geologic map and boring location plans are included in Appendix A of this report.

The purpose of these services is to provide information and preliminary geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- earthwork
- foundation design
- stormwater pond design
- pavement design

2.0 PROJECT INFORMATION

2.1 Project Description

Item	Description
Proposed Improvements	A detailed site plan was not available to us at the time of this report. However, we understand the existing soccer field at the site will be modified and/or a new soccer field will be constructed. Construction of a restroom building was considered as part of the soccer field improvements; however, the structure has been removed from the project. Construction of a stormwater pond and re-alignment of the existing driveway are anticipated as part of the soccer field improvements.

2.2 Site Location and Description

Item	Description
Location	The project is located north of West Colonial Drive on Dolores Drive in Orange County, Florida.
Current Ground Cover	The project area is within the existing Barnett Park site. The area of the proposed improvements has been cleared and appears to be currently used as playfields.
Existing Topography	The USGS topographic quadrangle maps "Orlando West, Florida" depicts the site and surrounding area with a ground surface elevations near +95 to +100 feet referencing the National Geodetic Vertical Datum of 1929 (NGVD29). Site specific topographic information provided indicates ground surface elevations ranging from +90 to +100 feet.
Surface Water	The quadrangle map indicated Lawne Lake north of the site with a recorded water level near +87 feet. Low-lying, marshy areas are mapped on the western portion of the site. Drainage ditches are located along the western and northern perimeter of the project area.

3.0 SUBSURFACE CONDITIONS

3.1 Soil Survey

The Soil Survey of Orange County, Florida, as prepared by the United States Department of Agriculture (USDA), Soil Conservation Service (SCS; later renamed the Natural Resource Conservation Service - NRCS), dated August 1989, identifies the soil type at the subject site as *Arents, nearly level (1)* and *Basinger fine sand, depressional (3).* It should be noted that the Soil Survey is not intended as a substitute for site-specific geotechnical exploration; rather it is a useful tool in planning a project scope in that it provides information on soil types likely to be encountered. Boundaries between adjacent soil types on the Soil Survey maps are approximate (included in Appendix as Exhibit A-2). Descriptions of the mapped soil units are included in Appendix A as Exhibit A-3.

3.2 Typical Profile

Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

- Generally, soils observed within the borings consisted of sands with varying amounts of silt (SP,SP-SM,SM) from the existing ground surface to the explored depths of 7 to 10 feet in the shallower borings and to about 23 feet below existing grade in Boring B-1. SPT blow counts measured in the sands indicated a relative density of loose in the upper 10 feet and medium dense to a depth of about 23 feet.

- Loose clayey fine sand (SC) was found in Boring B-1 at a depth of 23 feet below existing grade to the boring termination depth of 30 feet.

- Borings B-1 and B-2, performed in the northern portion of the explored area, found very soft peat/muck (Pt) in the upper 11 and 5.5 feet, respectively. The organic content of this peat/muck ranges from 92 to 93 percent.

Conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. Details for each of the borings can be found on the boring logs in Appendix A of this report. Descriptions of our field exploration are included as Exhibit A-5 in Appendix A. A description of our laboratory testing procedures is included as Exhibit B-1 in Appendix B.

3.3 Groundwater

The boreholes were observed during drilling for the presence and level of groundwater. Groundwater was observed in the borings, between depths of 1 to more than 7 feet below existing grade. Generally, shallower groundwater levels were observed in topographically lower areas of the site, Borings B-1 and B-2. Longer term monitoring in cased holes or piezometers, possibly installed to greater depths than explored under this project scope, would be required to better define groundwater conditions at the site.

It should be recognized that fluctuations of the groundwater table will occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the boring was performed. In addition, perched water can develop within higher permeability soils overlying less permeable soils. Therefore, groundwater levels during construction or at other times in the future may be higher or lower than the levels indicated on the boring logs.

We estimate that during the June through October wet season, with rainfall and recharge at a maximum, groundwater levels will range from above existing grade to about 3 to 4 feet below existing grade throughout most of the site. Our estimates of the normal seasonal groundwater conditions are based on the USDA Soil Survey, provided topographic information, the encountered soil types, and the encountered water levels. The estimated normal seasonal high groundwater tables are included in the following table and on the boring logs.

Boring #	Approximate Ground Surface Elevation (feet)	Depth to Encountered Water Table (feet)	Encountered Groundwater Elevation (feet)	Approximate Estimated Normal Seasonal High Groundwater Elevation (feet)
B-1	+92.9	3.0	+89.9	+92.0
B-2	+90.4	1.0	+89.4	+91.0
B-3	+98.5*	>7	<+91.5	+94.0
B-4	+96.5	>7	<+89.5	+93.0

* The ground surface elevation was not provided by the project surveyor. It was estimated from topographic information provided for Boring B-3.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

Due to highly organic soils observed in the upper 11 feet of the anticipated building location, over-excavation and replacement of these soils would be required for support of the structure on shallow foundations. Alternatively, use of a deep foundation system may be appropriate. Normal site preparation and conventional shallow foundation systems are not appropriate for support of structures and pavements over areas of organic soils without excessive settlement.

Lenses of sand with organics were observed in Borings B-3 and B-4. Following removal of root laden surficial layers, these slightly organic sands can remain in place below the proposed pavement areas, if left undisturbed. However, use of this material for structural fill or as backfill in utility trenches is not recommended.

Potential limitations to be considered during stormwater management design are the relatively shallow groundwater levels and the presence of relatively shallow highly organic soils. Use of a wet bottom stormwater pond or shallow dry bottom pond constructed in fill appears most appropriate. Underdrains may be required to provide adequate recovery of a dry pond system.

Our recommendations regarding design and construction of foundations, pavements, and stormwater management are provided in the following sections.

4.2 Earthwork

4.2.1 Site Preparation

We anticipate construction will be initiated by clearing any surface vegetation and other deleterious material and stripping the topsoil. Removal of 11 feet or more of surficial organic soils may be required if the restroom is constructed in the initially planned location, near Boring B-1. Demucking and stripping depths between our boring locations and across the site could vary and we recommend actual depths be evaluated by a representative of Nodarse/Page One during construction.

Dewatering is recommended to provide visual confirmation of adequate removal of unsuitable soils and to facilitate compaction of backfill soils. Dewatering to a minimum of 2 feet below the excavated surface is recommended. Backfill should consist of structural fill and compacted with the recommendations provided in this report.

Once stripping and demucking is complete, the exposed subgrade should be observed and proofrolled with a medium or heavy weight roller (minimum 10,000 pounds static weight). If existing nearby structures or the prevailing groundwater table are a concern, proofrolling should be performed in static mode. Proofrolling aids in providing a firm base for compaction of new fill and delineating soft or disturbed areas that may exist at or near the exposed subgrade level as well as overall densification of the upper loose sands. Proofrolling should be performed in the presence of a Nodarse/Page One representative in order to aid in evaluating unstable subgrade areas. Unstable areas observed at this time should be improved as recommended by the engineer based on field conditions and typically includes scarification and recompaction or by undercutting and replacement with suitable compacted fill.

Where fill is placed on existing slopes steeper than 5H:1V, benches should be cut into the existing slopes prior to fill placement. The benches should have a minimum vertical face height of 1 foot and a maximum vertical face height of 3 feet and should be cut wide enough to accommodate the compaction equipment. This benching will help provide a positive bond between the fill and natural soils and reduce the possibility of failure along the fill/natural soil interface. Furthermore, we recommend that fill slopes be over filled and then cut back to develop an adequately compacted slope face.

4.2.2 Material Requirements

Compacted structural fill should meet the following material property requirements:

Fill Type [1]	USCS Classification	Acceptable Location for Placement	Maximum Lift Thickness (in.)
General [1]	SP (fines content < 5%)	All locations and elevations	12[2]
	SP-SM (fines content between 5 and 12%)	All locations and elevations, except strict moisture control will be required during placement, particularly during the rainy season.	8 to 12[2]
Limited	SM, SC (fines content >12%)	Limited to mass fill greater than 2 feet below final grade; strict moisture control will be required during placement.	6 to 8[2,3]

1. Controlled, compacted fill should consist of approved materials that are free of organic matter and debris.
2. Loose thickness when heavy compaction equipment is used in vibratory mode. Lift thickness should be decreased if static compaction is being used, typically to no more than 8 inches, and the required compaction must still be achieved. Use 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is required.
3. Static equipment should be used.

4.2.3 Compaction Requirements

Item	Description
Fill Lift Thickness	12 inches or less in loose thickness when heavy compaction equipment is used in vibratory mode. Lift thickness should be decreased if static compaction is being used, typically to no more than 8 inches, and the required compaction must still be achieved. 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used.
Compaction Requirements [1]	95% of the material's maximum modified Proctor dry density (ASTM D 1557).
Moisture Content	Within ±2 percent of optimum moisture content as determined by the Modified Proctor test, at the time of placement and compaction. Depending on rainfall at the time and immediately prior to construction, the Contractor may need to add water to bring the moisture content closer to optimum. When adding water, care must be exercised so that erosion is not a concern.

1. We recommend that engineered fill be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.

4.2.4 Grading and Drainage

Final surrounding grades should be sloped away from the structure on all sides to prevent ponding of water. Gutters and downspouts that drain water a minimum of 10 feet beyond the footprint of the proposed structures are recommended. This can be accomplished through the use of splash-blocks, downspout extensions, and flexible pipes that are designed to attach to the end of the downspout. Flexible pipe should only be used if it is daylighted in such a manner that it gravity-drains collected water. Splash-blocks should also be considered below hose bibs and water spigots.

It is recommended that all exposed earth slopes be seeded to provide protection against erosion. Seeded slopes should be protected with erosion mats until the vegetation is established.

4.2.5 Earthwork Construction Considerations

Although the exposed subgrade is anticipated to be relatively stable upon initial exposure, unstable subgrade conditions could develop during general construction operations, particularly if the soils are wetted and/or subjected to repetitive construction traffic. The use of static compaction and/or light construction equipment would aid in reducing subgrade disturbance. The use of remotely operated equipment, such as a backhoe, would be beneficial to perform cuts and reduce subgrade disturbance. Should unstable subgrade conditions develop, stabilization measures will need to be employed.

As a minimum, all temporary excavations should be sloped or braced as required by Occupational Health and Safety Administration (OSHA) regulations to provide stability and safe working conditions. Temporary excavations will probably be required during grading operations. The Grading Contractor, by his contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required, to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, state and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards.

Depending on groundwater levels at the time of construction, temporary lowering of the groundwater level (dewatering) at the site may be necessary. The purposes of dewatering are to facilitate compaction of the subgrade soils during proofrolling and to provide dry, stable footing excavations. Dewatering can probably be accomplished at this site by a system of temporary drainage ditches graded to drain to sumps which can be pumped sufficiently to maintain water levels at the ditch bottoms. However, dewatering methods should be determined by the contractor.

Due to the presence of cemented soil lenses, difficult excavations should be anticipated. The Contractor should be prepared to utilize specialized equipment and/or methods to facilitate difficult excavations.

4.3 Foundations

In our opinion, the proposed small structure can be supported by shallow foundation systems following adequate removal of highly organic unsuitable soils and placement of properly compacted structural fill. The following recommendations assume that adequate demucking and proper backfilling is performed in the structure area.

4.3.1 Foundation Design Recommendations

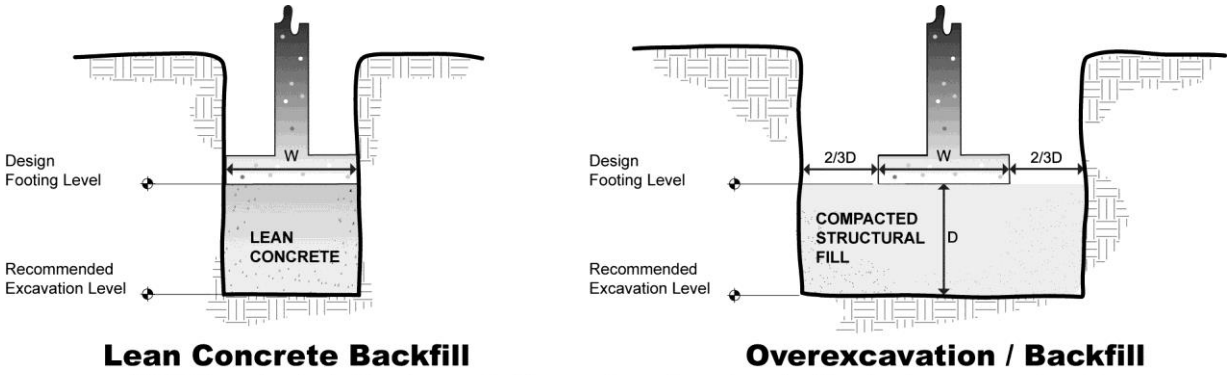
Description	Column	Wall
Net allowable bearing pressure [1]		
■ **Compacted structural fill or native soils**	2,000 psf	2,000 psf
Minimum dimensions	30 inches	18 inches
Minimum embedment below finished grade [2]	18 inches	24 inches

1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Assumes any unsuitable existing fill or soft soils will be undercut and replaced with compacted structural fill. Based upon a minimum Factor of Safety of 3.
2. Relative to lowest adjacent finished grade, typically exterior grade.

4.3.2 Foundation Construction Considerations

The base of all foundation excavations should be free of water and loose soil prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Should the soils at bearing level become excessively dry, disturbed or saturated, the affected soil should be removed prior to placing concrete. It is recommended that the geotechnical engineer be retained to observe and test the soil foundation bearing materials.

Nodarse/Page One anticipates hand-operated compaction equipment will be utilized, as necessary, in footing cuts, following any mass grading. If unsuitable bearing soils are encountered in footing excavations, the excavation should be extended deeper to suitable soils and the footing could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. As an alternative, the footings could also bear on properly compacted backfill extending down to the suitable soils. Over-excavation for compacted backfill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of over-excavation depth below footing base elevation. The over-excavation should then be backfilled up to the footing base elevation per the preceding general earthwork specifications, using hand operated compaction equipment in footing cuts. The over-excavation and backfill procedure is described in the following figure.



NOTE: Excavations in sketches shown vertical for convenience. Excavations should be sloped as necessary for safety.

4.4 Floor Slabs

4.4.1 Floor Slab Design Recommendations

Item	Description
Floor Slab Support	Free draining granular material meeting the general fill specification.
Modulus of Subgrade Reaction	100 pounds per square inch per inch (psi/in) for point loading conditions.
Compaction Requirements	95 percent of the materials maximum Modified Proctor dry density (ASTM D 1557).
Item	**Description**
Minimum Testing Frequency	One field density test per 500 square feet (or fraction thereof)

Where appropriate, saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or any cracks that develop should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

4.4.2 Floor Slab Construction Considerations

The use of a vapor retarder should be considered beneath concrete slabs-on-grade that will be covered with wood, tile, carpet or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. We note that FBC Section 1807 requires a minimum of 6-mil polyethylene, which is typically used in Florida. However, local requirements that might affect what moisture barrier may use should also be consulted.

4.5 Pavements

The near surface soil throughout most of the site consisted of fine sand with varying amounts of silt. Adequate demucking and backfilling will be required if pavement areas encroach into areas where organic soils are present. Stabilizing material will likely be necessary for the construction of pavement subgrades.

4.5.1 Subgrade Preparation

Site grading is typically accomplished relatively early in the construction phase. Fills are placed and compacted in a uniform manner. However, as construction proceeds, excavations are made into these areas, rainfall and surface water saturates some areas, heavy traffic from concrete trucks and other delivery vehicles disturbs the subgrade and many surface irregularities are filled in with loose soils to temporarily improve ride comfort. As a result, the pavement subgrades, initially prepared early in the project, should be carefully evaluated as the time for pavement construction approaches.

We recommend the moisture content and density of the top 12 inches of the subgrade be evaluated and the pavement subgrades be proofrolled and tested within two days prior to commencement of actual paving operations. Compaction tests should be performed at a frequency of 1 test per 10,000 square feet or fraction thereof. Areas not in compliance with the required ranges of moisture or density should be moisture conditioned and recompacted. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are found should be repaired by removing and replacing the materials with properly compacted fills.

After proofrolling and repairing deep subgrade deficiencies, the entire subgrade should be scarified and prepared as recommended in Section **4.2** of the **Earthwork** section this report to provide a uniform subgrade for pavement construction. Areas that appear severely desiccated following site stripping may require further undercutting and moisture conditioning. If a significant precipitation event occurs after the evaluation or if the surface becomes disturbed, the subgrade should be reviewed by qualified personnel immediately prior to paving. The subgrade should be in its finished form at the time of the final review.

4.5.2 Design Considerations

Traffic patterns and anticipated loading conditions were not available at the time that this report was prepared. However, we anticipate that traffic loads will be produced primarily by automobile traffic and occasional delivery and trash removal trucks. The thickness of pavements subjected to heavy truck traffic should be determined using expected traffic volumes, vehicle types, and vehicle loads and should be in accordance with local, city or county ordinances.

Pavement thickness can be determined using AASHTO, Asphalt Institute, PCA, and/or other methods if specific wheel loads, axle configurations, frequencies, and desired pavement life are provided. Nodarse/Page One can provide thickness recommendations for pavements subjected to loads other than personal vehicle and occasional delivery and trash removal truck traffic if this information is provided. However, absent that data, we recommend the following minimum typical sections.

4.5.3 Estimates of Minimum Pavement Thickness

Typical Pavement Section (inches)						
Traffic Area	**Alternative**	**Asphalt Concrete Surface Course**	**Limerock, Soil-Cement or Crushed Concrete Base Course**	**Stabilized Subbase Course[2,3,4]**	**Portland Cement Concrete**	**Free Draining Subgrade**
Car Parking	PCC	--	--		5.0	18.0
	AC	1.5	6.0	12.0	--	--
Truck and Drive Areas	PCC	--	--		6.0	18.0
	AC	2.5	8.0	12.0	--	--
Trash Container Pad [1]	PCC	--	--		6.0	18.0

1. The trash container pad should be large enough to support the container and the tipping axle of the collection truck.
2. Often referred to as Stabilized Subgrade.
3. Use coarse granular materials such as recycled crushed concrete, shell, or gravel when seasonal high groundwater is within 4 feet of the profile grade. Clay stabilization is acceptable with deeper seasonal high groundwater.
4. Some municipalities do not require stabilized subbase beneath soil-cement base.

4.5.4 Asphalt Concrete Design Recommendations

The following items are applicable to asphalt concrete pavement sections.

- Nodarse/Page One recommends a minimum separation of 12 inches between the bottom of the base course and the seasonal high water table.
- Natural or fill subgrade soils to a depth of 18 inches below the base should be clean, free draining sands with a fines content passing a No. 200 sieve of 7 percent or less.

- Stabilized subgrade soils (also identified as stabilized subbase) should be stabilized to a minimum Limerock Bearing Ratio (LBR; Florida Method of Test Designation FM 5-515) value of 40 if they do not already meet this criterion, or modified/replaced with new compacted fill that meets the minimum LBR value. Although LBR testing has not been performed, our experience with similar soils indicates that the near surficial sands encountered in the soil borings are unlikely to meet this requirement.

- The stabilized subgrade course should be compacted to at least 98 percent of the Modified Proctor maximum dry density (AASHTO T-180 or ASTM D-1557). Any underlying, newly-placed subgrade fill need only be compacted to a minimum of 95 percent of the Modified Proctor maximum dry density. Compaction tests should be performed at a frequency of 1 test per 10,000 square feet or fraction thereof.

- Limerock base courses from an approved FDOT source should have a minimum LBR value of 100, and be compacted to a minimum of 98 percent of the maximum dry density as determined by the Modified Proctor test. Limerock should be placed in uniform lifts not to exceed 6 inches loose thickness. Recycled limerock is not a suitable substitute for virgin limerock for base courses but may be used as a granular stabilizing admixture.

- Soil cement base courses typically experience shrinkage cracking due to hydration curing of the cement. This shrinkage cracking typically propagates through the overlying asphalt course and reflects in the pavement surface. This reflective cracking is not necessarily indicative of a pavement structural failure, though it is sometimes considered to be aesthetically undesirable.

- Soil cement bases should have 7-day design strength of 300 psi. Soil cement base should be compacted to a minimum of 98 percent of the material's maximum dry density as determined by the Standard Proctor Test for Soil Cement (AASHTO T-134). Higher design strengths may result in increased cracking.

- Crushed (recycled) concrete base should meet the current FDOT specification 204 for recycled materials.

- Asphalt should be compacted to a minimum of 95 percent of the design mix density. Asphalt surface courses should be Type SP, Type S, or other suitable mix design according to FDOT and local requirements.

- To verify thicknesses, after placement and compaction of the pavement courses, core the wearing surface to evaluate material thickness and composition at a minimum frequency of 5,000 square feet or two locations per day's production.

- Underdrains or strip drains should be considered along all landscaped areas in, or adjacent to pavements to reduce moisture migration to subgrade soils. Underdrains will also be required below pavement if the separation between the bottom of the base course and the seasonal high groundwater table is less than 1 foot. Orange County will require soil cement on all of the project roads if underdrains are required for high groundwater conditions.

- All curbing should be full depth. Use of extruded curb sections which lie on top of asphalt surface courses can allow migration of water between the surface and base courses, leading to rippling and pavement deterioration.

4.5.5 Portland Cement Concrete Design Recommendations

The following items are applicable to rigid concrete pavement sections.

- At least 18 inches of free-draining material should be included directly beneath rigid concrete pavement. Fill meeting the requirements presented in Section 4.2 (Earthwork) of this report may be considered free-draining for this purpose. Limerock should not be considered free draining for this purpose.

- The PCC should be a minimum of 4,000 psi at 28 days. PCC pavements are recommended for trash container pads and in any other areas subjected to heavy wheel loads and/or turning traffic.

- The upper 1 foot of rigid pavement subgrade soils should be compacted to at least 98 percent of the Modified Proctor maximum dry density (AASHTO T-180 or ASTM D-1557). Compaction tests should be performed at a frequency of 1 test per 10,000 square feet or fraction thereof.

- Rigid PCC pavements will perform better than ACC in areas where short-radii turning and braking are expected (i.e. entrance/exit aprons) due to better resistance to rutting and shoving. In addition, PCC pavement will perform better in areas subject to large or sustained loads. An adequate number of longitudinal and transverse control joints should be placed in the rigid pavement in accordance with ACI and/or AASHTO requirements. Expansion (isolation) joints must be full depth and should only be used to isolate fixed objects abutting or within the paved area.

- Adequate separation should be provided between the bottom of the concrete and the seasonal high water table. Nodarse/Page One recommends that in no case should less than 1 foot of separation be provided.

- Sawcut patterns should generally be square or rectangular but nearly square, and extend to a depth equal to a quarter of the slab thickness. If the bottom of the concrete pavement is separated from the seasonal high water table by at least 1 foot, filter fabric will not be necessary beneath the expansion joints.

4.5.6 Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. The subgrade and the pavement surface should have a minimum ¼ inch per foot slope to promote drainage. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the base layer.

4.5.7 Pavement Maintenance

The pavement sections provided in this report represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. Therefore preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment. Maintenance consists of both localized maintenance (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Preventive maintenance is usually the first priority when implementing a pavement maintenance program. Additional engineering observation is recommended to determine the type and extent of a cost effective program. Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required.

4.6 Stormwater Ponds

Design of the stormwater management system has not been completed yet. Dry retention ponds generally need to be at least 1 foot and sometimes as much as 3 feet (or more for large ponds) above the seasonal high water table to recover adequately.

Due to relatively high groundwater levels at the site, the use of wet bottom ponds appears most feasible. Use of shallow dry-bottom swales may also be feasible if the site is adequately filled. Use of underdrains may be required to allow a dry pond system to adequately recover.

If a dry pond is used, the pond should be constructed in naturally occurring, well-draining sand. To reduce the potential of the pond holding water, the surface of the in-situ silty sand and organic soils to remain in place should be graded to provide positive drainage. Simply over-excavating and replacement of a “box” in the in-situ soils will create a “bathtub” effect and underdrains will be required to allow adequate recovery.

Stormwater pond recovery analyses and underdrain design should consider backfill soils to be placed in the pond area. A note should be added to the plans specifying the minimum permeability rate assumed in the analyses and design and the Contractor should provide testing to ensure the backfill soils provided meet the design criteria prior to placement in the pond area. Testing should consider the in-place compacted state of the material placed in the pond area.

Nodarse/Page One would be pleased to assist in recovery analysis once plans are better defined.

5.0 GENERAL COMMENTS

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction.

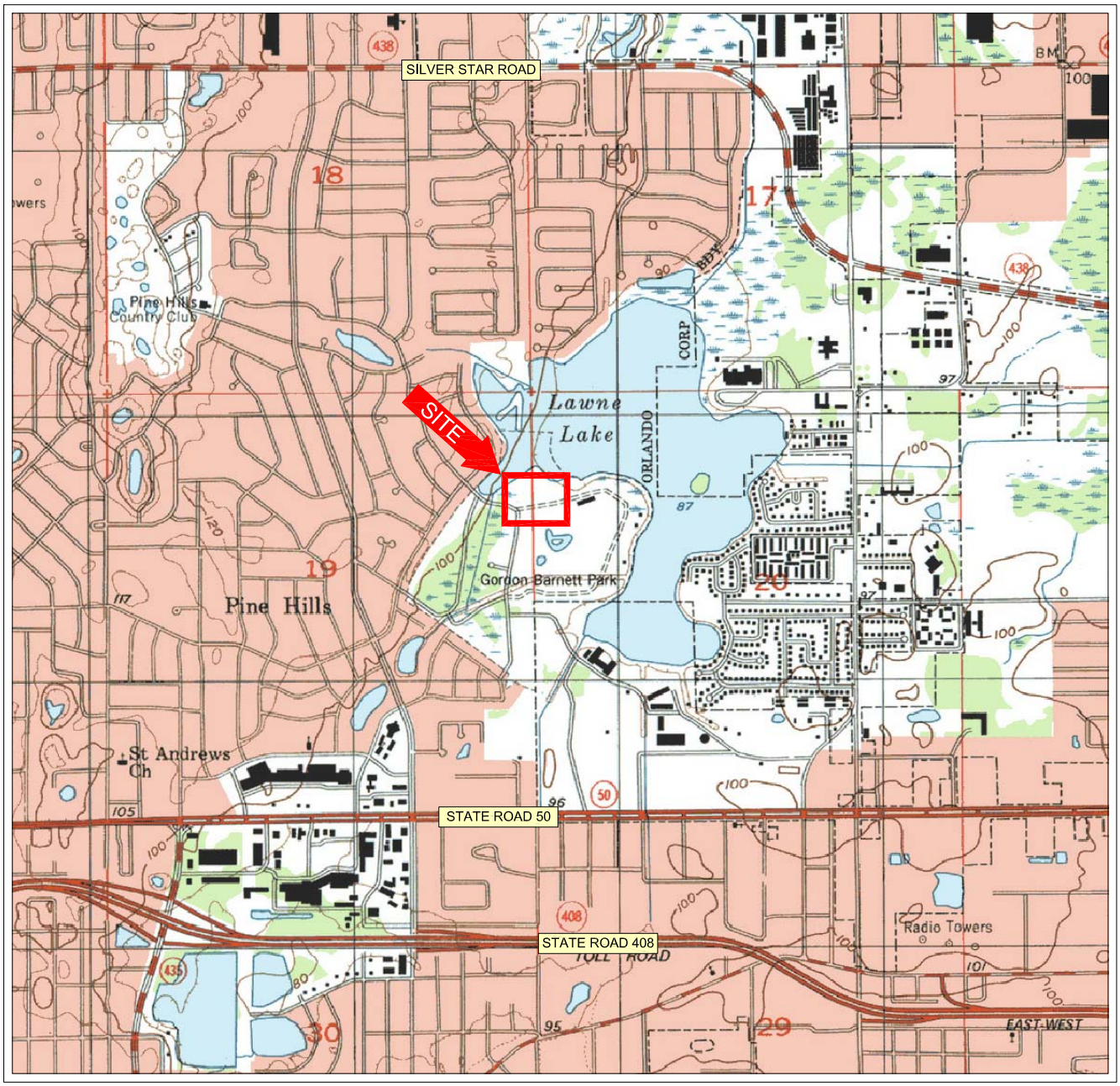
The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either expressed or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Nodarse/Page One reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A

FIELD EXPLORATION

UNITED STATES – DEPARTMENT OF THE INTERIOR – GEOLOGICAL SURVEY



SCALE 1:24 000

1 .5 0 KILOMETERS 1 2

1000 0 MILES 1000 2000

1 .5 0 1

FEET

1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 5 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

N

SECTION: 19 AND 20
TOWNSHIP: 22 SOUTH
RANGE: 29 EAST

ORLANDO WEST, FLORIDA
1995
7.5 MINUTE SERIES (QUADRANGLE)

N:\Projects\2014\AK145002\PROJECT DOCUMENTS (Reports-Letters-Drafts to Clients)\Cad\AK145002-Exhibit-A-1.dwg

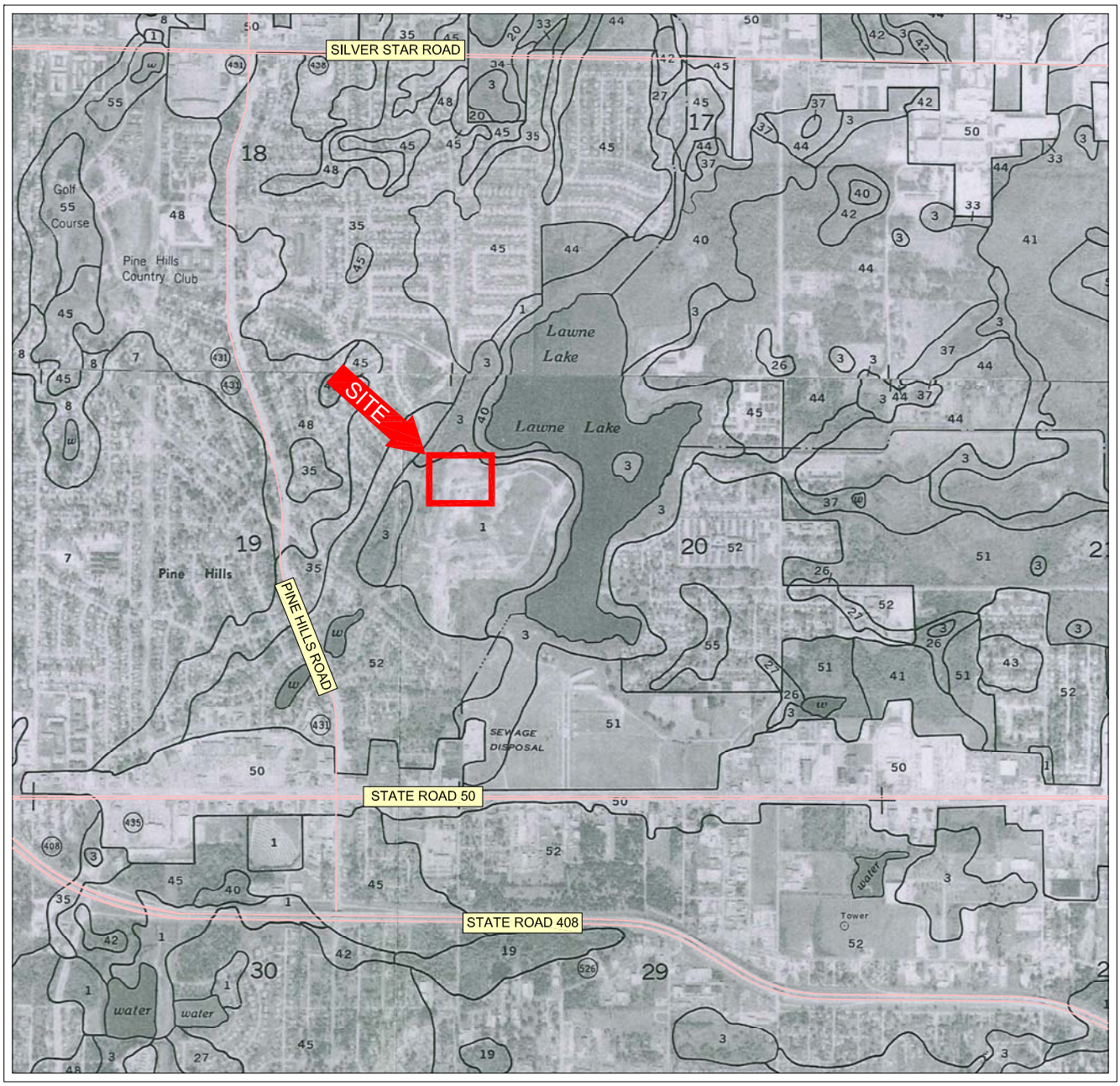
Project Mngr:	SM
Drawn By:	MG
Checked By:	SM
Approved By:	BHW

Project No.	AK145002
Scale:	AS SHOWN
File No.	AK145002
Date:	3-26-14

Terracon
Consulting Engineers and Scientists
1675 LEE ROAD WINTER PARK, FLORIDA 32789
PH. (407) 740-6110 FAX. (407) 740-6112

TOPOGRAPHIC VICINITY MAP
GEOTECHNICAL ENGINEERING REPORT
BARNETT PARK SOCCER FIELD
ORLANDO, ORANGE COUNTY, FLORIDA

EXHIBIT
A-1



SCALE 1" = 2000'

1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

U.S.D.A. SOIL SURVEY FOR ORANGE COUNTY, FLORIDA
ISSUED: 1989

N

SECTION: 19 AND 20
TOWNSHIP: 22 SOUTH
RANGE: 29 EAST

SOIL LEGEND	
1	ARENTS, NEARLY LEVEL
3	BASINGER FINE SAND, DEPRESSIONAL

Project Mngr:	SM
Drawn By:	MG
Checked By:	SM
Approved By:	BHW
Project No.	AK145002
Scale:	AS SHOWN
File No.	AK145002
Date:	3-26-14

Terracon
Consulting Engineers and Scientists
1675 LEE ROAD WINTER PARK, FLORIDA 32789
PH. (407) 740-6110 FAX. (407) 740-6112

SOILS MAP
GEOTECHNICAL ENGINEERING REPORT
BARNETT PARK SOCCER FIELD
ORLANDO, ORANGE COUNTY, FLORIDA

EXHIBIT
A-2

N:\Projects\2014\AK145002\PROJECT DOCUMENTS (Reports-Letters-Drafts to Clients)\Cad\AK145002-Exhibit-A-2.dwg

Soil Survey Descriptions

1 – Arents, nearly level. Arents consists of material dug from several areas that have different kinds of soil. This soil is used to fill such areas as sloughs, marshes, shallow depressions, swamps, and other low-lying areas above their natural ground levels during land leveling operations. Arents are also used as a cover for sanitary landfills. The seasonal high water table varies with the amount of fill material and artificial drainage in any mapped area. In most years, the seasonal high water table is at a depth of 24 to 36 inches (2.0 to 3.0 feet) for 2 to 4 months. The water table recedes to a depth of about 60 inches (5.0 feet) or more during extended dry periods. In many areas, Arents has a surface layer that is 30 to 50 inches (2.5 to 4.2 feet) thick and is predominantly sandy, with discontinuous loamy (silty to clayey) fragments. Below the surface layer is undisturbed soil that is predominantly sandy and extends throughout the defined depth of 80 inches (6.7 feet).

3 – Basinger fine sand, depressional. This soil type is nearly level and poorly drained. It is typically found in shallow depressions and sloughs along edges of freshwater marshes and swamps. In its natural state, water stands on the surface of this soil type for 6 to 9 months during most years and is within 12 inches of the surface for the rest of the year. This soil type is sometimes associated with a surficial organic layer, typical thickness of 7 inches, typical organic contents of between 1 and 8 percent.

LEGEND

APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING

N

SCALE IN FEET

0 60 120

Project Mngr:	SM
Drawn By:	MG
Checked By:	SM
Approved By:	BHW

Project No.	AK145002
Scale:	AS SHOWN
File No.	AK145002
Date:	3-26-14

Terracon
Consulting Engineers and Scientists
1675 LEE ROAD WINTER PARK, FLORIDA 32789
PH. (407) 740-6110 FAX. (407) 740-6112

BORING LOCATION PLAN

GEOTECHNICAL ENGINEERING REPORT

BARNETT PARK SOCCER FIELD

ORLANDO, ORANGE COUNTY, FLORIDA

EXHIBIT

A-4

N:\Projects\2014\AK145002\PROJECT DOCUMENTS (Reports-Letters-Drafts to Clients)\Cad\AK145002-Exhibit-A-4.dwg

Field Exploration Description

The borings were located in the field with a hand held GPS device using longitude and latitude coordinates obtained from on-line Google Earth imagery. The project surveyor, Southeastern Surveying, located staked boring locations and provided ground surface elevations for the borings, except B-3.

The SPT soil borings were drilled with a truck-mounted, rotary drilling rig equipped with a rope and cathead safety hammer. The boreholes were advanced with a cutting head and stabilized with the use of bentonite (drillers' mud). Soil samples were obtained by the split spoon sampling procedure in general accordance with the Standard Penetration Test (SPT) procedure. In the split spoon sampling procedure, the number of blows required to advance the sampling spoon the last 12 inches of an 18-inch penetration or the middle 12 inches of a 24-inch penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration resistance value (N). This value is used to estimate the in-situ relative density of cohesionless soils and the consistency of cohesive soils. The sampling depths and penetration distance, plus the standard penetration resistance values, are shown on the boring logs.

The hand auger boring procedure consisted of manually turning a 3 inch diameter, 6 inch long sampler into the soil until it is full. The sampler was then retrieved and the soils in the sampler were visually examined and classified. The procedure was repeated until the desired termination depth was achieved. Samples of representative strata were obtained for further visual examination and classification in our laboratory.

Portions of the samples from the borings were sealed in glass jars to reduce moisture loss, and then the jars were taken to our laboratory for further observation and classification. Upon completion, the boreholes were backfilled with the site soil.

Field logs of each boring were prepared by the drill crew. These logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. The boring logs included with this report represent an interpretation of the field logs and include modifications based on laboratory observation of the samples.

BORING LOG NO. B-1

PROJECT: Barnett Park Soccer Field

CLIENT:

SITE: Barnett Park
Orlando, Orange County, Florida

LOCATION See Exhibit A-4

Latitude: 28.56334° Longitude: 81.44197°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	ORGANIC CONTENT (%)	WATER CONTENT (%)
1.5		**SAND WITH SILT (SP-SM)**, trace organics (topsoil), fine grained, gray, loose				3-4-5-7 N=9		
3.5		**SAND (SP)**, fine grained, light brown, loose				9-4-3-3 N=7		
5.0		**SILTY FINE SAND (PT)**, with organics, fine grained, dark brown, very loose	5			WH		
11.0		**PEAT (PT)**, dark brown, soft				1-0-1-0 N=1	93	675
						1-1-2-2 N=3		
13.5		**SILTY SAND (SM)**, fine grained, brown, medium dense	10			6-6-7 N=13		
23.5		**SILTY SAND (SM)**, trace clay, fine grained, light brown, medium dense	15			11-9-8 N=17		
			20			7-7-7 N=14		
30.0		**CLAYEY SAND (SC)**, fine grained, gray to light brown, loose	25			6-4-4 N=8		
						3-4-4 N=8		
		Boring Terminated at 30 Feet	30					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Mud Rotary

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-5 for description of field procedures
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water Initially Observed at 3.0'

Estimated Seasonal High Groundwater Level

Terracon
1675 Lee Road
Winter Park, Florida

Boring Started: 3/18/2014 Boring Completed: 3/18/2014

Drill Rig: CME-55 Driller: Melvin

Project No.: AK145002 Exhibit: A-6

BORING LOG NO. B-2

PROJECT: Barnett Park Soccer Field

CLIENT:

SITE: Barnett Park
Orlando, Orange County, Florida

LOCATION See Exhibit A-4

Latitude: 28.56318° Longitude: 81.44379°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	ORGANIC CONTENT (%)	WATER CONTENT (%)
		SILTY SAND (SM), with organics, fine grained, dark brown, very loose		▽		1-2-1-2 N=3		
	1.5	**PEAT (PT)**, dark brown, very soft				1-0-1-0 N=1	92	339
	5.5		5			0-1-0-1 N=1		
		SILTY SAND (SM), trace organics, fine grained, dark brown, loose				2-4-5-9 N=9		
	7.5	**SAND WITH SILT (SP-SM)**, fine grained, brown, loose				5-5-7-7 N=12		
	9.5							
	10.0	**SAND (SP)**, fine grained, light brown, medium dense	10					
		Boring Terminated at 10 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Mud Rotary

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-5 for description of field procedures
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water Initially Observed at 3.5'*

▽ *Estimated Seasonal High Groundwater Level*

Terracon
1675 Lee Road
Winter Park, Florida

Boring Started: 3/18/2014 Boring Completed: 3/18/2014

Drill Rig: CME-55 Driller: Melvin

Project No.: AK145002 Exhibit: A-7

BORING LOG NO. B-3

PROJECT: Barnett Park Soccer Field

CLIENT:

SITE: Barnett Park
Orlando, Orange County, Florida

LOCATION See Exhibit A-4

Latitude: 28.56271° Longitude: 81.44315°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	ORGANIC CONTENT (%)	WATER CONTENT (%)
		SILTY SAND (SM), with organics, fine grained, dark brown					9	29
1.5		**SAND WITH SILT (SP-SM)**, fine grained, light brown to brown to gray-brown						
			5	▽				
7.0		***Boring Terminated at 7 Feet***						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Mud Rotary

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-5 for description of field procedures
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water Not Initially Observed to the Depth of 7.0'

▽ *Estimated Seasonal High Groundwater Level*

Terracon
1675 Lee Road
Winter Park, Florida

Boring Started: 3/18/2014 Boring Completed: 3/18/2014

Drill Rig: N/A Driller: Melvin

Project No.: AK145002 Exhibit: A-8

BORING LOG NO. B-4

PROJECT: Barnett Park Soccer Field

CLIENT:

SITE: Barnett Park
Orlando, Orange County, Florida

LOCATION See Exhibit A-4

Latitude: 28.56295° Longitude: 81.44264°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	ORGANIC CONTENT (%)	WATER CONTENT (%)
	1.5	**SILTY SAND (SM)**, trace organics (topsoil), fine grained, dark brown						
	3.5	**SILTY SAND (SM)**, fine grained, gray-brown		▽				
	7.0	**SILTY SAND (SM)**, with organics, fine grained, dark brown	5				6	19
		Boring Terminated at 7 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Mud Rotary

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-5 for description of field procedures
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Water Not Initially Observed to the Depth of 7.0'

▽ *Estimated Seasonal High Groundwater Level*

Terracon
1675 Lee Road
Winter Park, Florida

Boring Started: 3/18/2014 Boring Completed: 3/18/2014

Drill Rig: N/A Driller: Melvin

Project No.: AK145002 Exhibit: A-9

APPENDIX B

LABORATORY TESTING

Laboratory Testing

During the field exploration, a portion of each recovered sample was sealed in a glass jar and transported to our laboratory for further visual observation and laboratory testing. Selected samples retrieved from the borings were tested for moisture (water) content and organic content. Those results are included in this report on the respective boring logs. The visual-manual classifications were modified as appropriate based upon the laboratory testing results.

The soil samples were classified in general accordance with the appended General Notes and the Unified Soil Classification System based on the material's texture and plasticity. The estimated group symbol for the Unified Soil Classification System is shown on the boring logs and a brief description of the Unified Soil Classification System is included in Appendix C. The results of our laboratory testing are presented on the corresponding borings logs.

APPENDIX C

SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING

- Auger Cuttings
- Rock Core
- Grab Sample
- No Recovery
- Shelby Tube
- Standard Penetration Test

WATER LEVEL

- **Water Initially Encountered**
- **Water Level After a Specified Period of Time**
- **Water Level After a Specified Period of Time**

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	**Hand Penetrometer**
(T)	**Torvane**
(DCP)	**Dynamic Cone Penetrometer**
(PID)	**Photo-Ionization Detector**
(OVA)	**Organic Vapor Analyzer**

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		**CONSISTENCY OF FINE-GRAINED SOILS** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (psf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 500	0 - 1
Loose	4 - 9	Soft	500 to 1,000	2 - 4
Medium Dense	10 - 29	Medium Stiff	1,000 to 2,000	4 - 8
Dense	30 - 50	Stiff	2,000 to 4,000	8 - 15
Very Dense	> 50	Very Stiff	4,000 to 8,000	15 - 30
		Hard	> 8,000	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

Terracon

Exhibit: C-1

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.

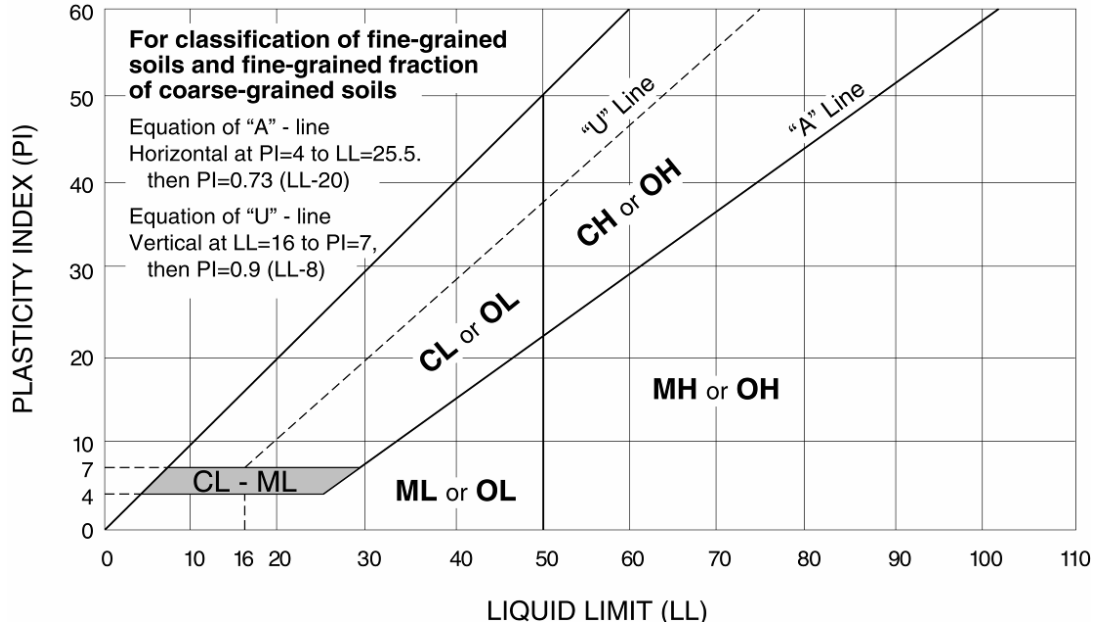


Exhibit C-2

SECTION 02110 - SITE CLEARING

PART 1 - GENERAL

1.01 SCOPE OF WORK:

Site clearing work includes, but is not limited to:

Removal of trees and other vegetation.
Topsoil stripping.
Clearing and grubbing.
Removing above grade improvements.
Removing below grade improvements.

1.02 RELATED SECTIONS:

Section 02200 - Earthwork

1.03 JOB CONDITIONS:

A. Traffic:

Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.

B. Protection of Existing Improvements:

Provide protection necessary to prevent damage to existing improvements indicated to remain in place.

Protect bench marks and existing work from damage or displacement.

Protect improvements on adjoining properties and on Owner's property.

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

C. Regulatory Requirements:

Conform to applicable local code for disposal of debris.

1.04 EROSION CONTROL:

Whether otherwise shown on the plans or not, provide adequate protection to eliminate contamination of streams, canals, lakes, reservoirs and other impoundments by oil, fuels, bitumen, calcium chloride or other harmful materials. Take positive steps to minimize erosion and resultant siltation.

Where air pollution is a factor water the haul roads and construction areas to help reduce the dust.

Where soil or other materials from the work area have been allowed, for whatever reason, to enter public lands, roads or streams, the Contractor shall remove the materials and repair any damage to the public facility.

Permanent erosion control features shall be installed as early as possible. Do not expose large areas of erodible earth at any one time and make every effort to protect against such erosion.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Topsoil:

Sandy clay surface soil found in depth of not less than 6". Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2" in diameter, and without weeds, roots, and other objectionable material.

PART 3 - EXECUTION

3.01 SITE CLEARING:

Remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of new construction.

Remove items elsewhere on site or premises as specifically indicated. Removal includes digging out stumps and roots.

Strip topsoil to whatever depths encountered to prevent intermingling with underlying subsoil or other objectionable material. Remove heavy growths of grass from areas before stripping.

Stockpile topsoil in storage piles in areas shown or where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent windblown dust.

Dispose of unsuitable or excess topsoil same as specified for waste material.

3.02 Clearing and Grubbing:

The trees selected by the Project Engineer for saving shall be protected from construction equipment by the Contractor in a manner approved by the Project Engineer and meeting the criteria for such protection as required by the applicable governmental agency.

Clear site of trees, shrubs, and other vegetation.

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

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

Place fill material in horizontal layers not exceeding 6" loose depth, and thoroughly compact to density equal to adjacent original ground, unless otherwise shown on the plans.

3.03 Removal of Improvements: Remove existing above grade and below grade improvements necessary to permit construction and other work.

Remove abandoned underground piping or conduit interfering with construction.

3.04 DISPOSAL OF WASTE MATERIALS:

Removal from Owner's Property: Remove waste materials and unsuitable and excess topsoil from Owner's property and dispose of off-site in legal manner.

END OF SECTION

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.01 SCOPE OF WORK:

Provide all labor, tools, materials, equipment and supervision necessary for excavation and site grading as specified herein.

1.02 RELATED WORK:

Section 02110 – Site Clearing

1.03 STANDARDS:

Comply with state and local environmental standards and as specified herein.

1.04 EARTHWORK:

Borrow material to be used for fill shall be tested for radon level. The contractor shall collect three samples of material at the borrow pit and submit them to a certified laboratory for testing. Radon levels shall not exceed 2pCi/g. The contractor shall submit certifications to the architect showing that the borrow material meets this criteria before bringing any material to the project site.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 EXCAVATION:

Excavation shall conform to the limits indicated on the plans or specified herein. This work shall include shaping and sloping and other work necessary in bringing the excavation to the required grade, alignment and cross section.

All suitable materials removed by the excavation shall be used as far as practicable in the formation of the embankments, subgrades, shoulders, and other places as directed. No excavated material shall be wasted without permission, and where necessary to waste such material, it shall be disposed of as directed by the Owner. Waste excavated material shall be considered property of the Owner and disposed of as directed by the Owner.

3.02 AREA EXCAVATION:

The area of excavation shall be as indicated on the construction plans.

3.03 FILLING AND COMPACTING:

Replace excavated material as necessary. Place fill in layers and compact to a minimum density at optimum moisture as required.

3.04 EMBANKMENT:

Embankments shall be constructed of material containing no muck, stumps, roots, brush, vegetable matter, rubbish or other material that will not compact into a stable finished grade surface.

Embankments shall be formed 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. Each layer shall be uniformly compacted, using equipment that will achieve the required density. As compaction operations progress, each layer shall be shaped and manipulated as necessary to assure density throughout the embankment or backfill. Moisture content shall be such that the specified density can be reached and, if necessary, water shall be added or the material manipulated to assist drying. 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. Layer thickness shall be decreased if equipment and methods used are proven to be incapable of compacting layers to specified densities.

Embankment on building sites, shall be compacted to a density of not less than 100 percent of its maximum density as determined by AASHTO T 99, Method C.

The bottoms of the drainage retention areas shall not be compacted so as to not reduce the soil infiltration capacity.

Final earthwork elevations shall be within 0.2 feet of the proposed elevations.

3.05 MAINTENANCE AND PROTECTION OF WORK:

The Contractor shall maintain all earthwork construction throughout the life of the contract, unless otherwise provided, and shall take all reasonable precautions to prevent loss of material from the site due to the action of wind or water. He shall repair at his expense, except as otherwise provided herein, any slides, washouts, settlement, subsidence, or other mishap which may occur prior to final acceptance of work.

3.06 FINAL DRESSING:

Before final acceptance, the Contractor shall dress all earthwork to the planned line, grade and cross section. Ditches shall be shaped so that no water is impounded, unless otherwise shown on the plans. Earthwork shall be shaped to match adjacent grades, structures, etc.

3.07 SUBGRADE STABILIZATION

Methods of Subgrade Stabilization: Subgrade shall be stabilized by either: (i) addition of approved materials to the existing subgrade, or (ii) manipulating materials already in existence in the subgrade to achieve the desired results. It is the intent of this Specification that the subgrade be uniform, compact, capable of carrying reasonable loads, meet the required density and the required bearing value specified in the plans and/or these Specifications.

Mixing and Compacting: Additive materials shall be spread uniformly over the entire surface to be stabilized using a mechanical spreader, for a length that will provide sufficient distance to promote uniform mixing. A spreading tolerance of three inches (3) in excess of plan width will be tolerated on each side.

Mixing shall be done, with rotary tillers, or other equipment meeting the Engineer's approval, for the full depth shown in the plans, and for the full width of the stabilizing limits.

The Contractor may, if he so elects, mix the materials in a plant of an approved type in lieu of the spreading and mixing operation described above.
Where the subgrade is of rock, the Engineer shall determine whether or not it is necessary to undercut and stabilize the subgrade and, if he determines the rock subgrade is extensive enough in nature to waive the requirement for subgrade stabilization, he shall so notify the Contractor in writing.

At the completion of the mixing any particles within the limits of the stabilizing area not passing a three and one half inch (3 1/2") sieve shall be removed or broken down.

After mixing has been completed and requirements for bearing value, uniformity and particle size have been satisfied, the stabilized area shall be compacted to at least 96 percent of its maximum density as determined by AASHTO T180. If the moisture content of the material is improper for attaining the specified density, either water shall be added or the material permitted to dry to the proper moisture.

Spreading, mixing and compacting shall be done as one lift unless otherwise specified in the plans.

After stabilizing and compacting operations have been completed the subgrade shall be firm and substantially unyielding, to the extent it will support construction equipment, and will have the bearing value required by the plans. All soft and unyielding material and any other portions of the

subgrade which will not compact readily shall be removed and replaced with suitable material and the whole subgrade brought to line and grade, with proper allowance for subsequent compaction.

Maintenance of Completed Subgrade: The Contractor shall be wholly responsible for maintaining the completed subgrade free from ruts, depressions, damage from hauling or handling of materials, tools and equipment. Such responsibility shall include any repairs, replacements, etc. of curbs, curb and gutter, sidewalks or other structures which might become necessary in order to recompact the subgrade in the event of underwash or other damage occurring to the previously compacted subgrade. The subgrade shall be restored to an acceptable condition prior to placement of base.

Tolerances in Bearing Value Requirements: The following under-tolerances from the specified bearing value will be allowed as based on tests performed on samples obtained after mixing operations have been complete:

SPECIFIED LIMEROCK BEARING RATION	MAXIMUM PERMITTED UNDER TOLERANCE
LBR 40	5.0
LBR 35	4.0
LBR 30 or Under	2.5

Local Materials:

Local materials used for stabilizing may be high bearing value soils or sand-clay materials. The portion of the material passing the 40 mesh sieve shall have a liquid limit not greater than 30 and a plasticity index not greater than ten (10). Local materials, may, if so approved by the Engineer, be blended to achieve the above requirements but, if so blended shall be tested and approved before spreading on the roadway.

Commercial Materials:

Commercial materials used for stabilization may consist of commercial limerock, lime-rock overburden or crushed shell. For limerock and limerock overburden the percentage of carbonates of calcium and magnesium shall be at least 70, and the plasticity index shall not exceed ten (10). The gradation of limerock and limerock overburden shall be such that 97 percent of the material will pass a one inch (1") sieve.

Crushed shell for this use shall be mollusk shell (oyster, mussels, clams, cemented coquina, etc.). Steamed shell shall not be permitted. At least 97 percent by weight of the crushed shell shall pass the three and one-half inch (3 1/2") sieve and at least 50 percent by weight of the total material shall be retained in the No. 4 sieve. In addition, no more than 15 percent by weight of the total material shall pass the No. 200 sieve when washed over the sieve. In the event the shell meets the above criteria without crushing, the crushing will not be required.

END OF SECTION

SECTION 02220 - EXCAVATING, BACKFILLING, AND COMPACTING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work included under this Section consists of excavating, backfilling and compacting as required for the construction of the utility system consisting of piping and appurtenances as shown on the Drawings and specified herein.

B. 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. Rock Excavation: Excavation of any hard natural substance which requires the use of explosives and/or special impact tools such as jack hammers, sledges, chisels or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery.

4. Suitable: Suitable materials for fills shall be a noncohesive, nonplastic granular local sand and shall be free from vegetation, organic material, marl, silt or muck. The Contractor shall furnish all additional fill material required.

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

C. 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 substrata, 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. Prior to commencing the excavation, the Contractor shall submit a plan of his proposed operations to the Engineer for review. The Contractor shall consider, and his plan for excavation shall reflect, the equipment and methods to be employed in the excavation. The prices established in the Proposal for the work to be done will reflect all costs pertaining to the work.

1.02 QUALITY ASSURANCE

A. A testing laboratory employed by the Owner will make such tests as are deemed advisable. The Contractor shall schedule his work so as to permit a reasonable time for

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 tests which have to be repeated because of the failure of the tested material to meet specification shall be paid for by the Contractor and the cost of any tests shall be deducted from payments due the Contractor.

B. Standards:

1. OSHA 29 CFR Subpart P - Excavations and Trenches a) 1926.650, 1926.651, 1926.652.

2. OSHA 29 CFR Subpart J - a) 1910.146 for Confined Space Entry.

1.03 JOB CONDITIONS

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 the Engineer, conditions encountered during construction warrant a change in the footing elevation, or in the depth of removal of unsuitable material from that indicated on the Drawings, an adjustment will be made in the contract price, as provided in the Schedule of cost for Changes in Quantities.

1.04 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 the Engineer/RPR 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 the Contractor, and compliance with such order shall not relieve or release the Contractor from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and compacted. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill at no additional expense to the 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 the Contractor at his own expense so as to provide the necessary clearances and dimensions.

3. Where sheeting and bracing is required to support the sides of excavations for structures, the 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 the Owner may direct him in writing to leave in place at any time during the progress of the work for the purpose of preventing injury to structures, utilities, or property, whether public or private. The Engineer/R.P.R. 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 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 the Engineer/R.P.R.

7. The right of the Engineer/R.P.R. to order sheeting and bracing left in place shall not be construed as creating any obligation on his 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. Groundwater Observation Wells:

1. Prior to excavation, the Contractor shall install groundwater observation wells at locations to be approved by the Engineer adjacent to structures under construction for the purpose of measuring water levels during excavation. The observation well shall consist of a screen, casing and cap of approved size and material of construction. The observation well shall be placed in a 2-1/2-inch bore hole which shall be carried to an

elevation at least 2 feet below final bottom grade of structure. The annular space surrounding the intake point and the riser pipe shall be sealed in such a way as to prevent infiltration from surface water. The observation well shall be developed in such a manner as to insure proper indication of subsurface water levels adjacent to the well.

2. The Contractor shall be responsible for maintaining the observation wells and for observing and recording the elevation of groundwater in them until adjacent structure is completed and backfilled. Each observation well shall be observed and recorded daily. Measurements shall be supplied daily to the R.P.R. and Engineer. The Engineer may require that the observation wells reflect true groundwater levels by adding water to the well recording the drop in level from the time the water was added. A plugged observation well shall be redeveloped as necessary to indicate true groundwater levels.

3. Observation well shall be abandoned when directed by the Engineer/R.P.R. and in a manner acceptable to the Engineer.

C. 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 extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels as stipulated in Section 02140. The Contractor shall engage a Professional Geotechnical Engineer registered in the State of Florida, to design the dewatering systems for all structures. The Contractor shall submit to the Engineer 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 require such modifications as may be 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 surface runoff shall be collected in 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 any 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 the Engineer or the authority having jurisdiction, at no cost to the Owner.

6. Floatation 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 the 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 groundwater quality.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:

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

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 the Contractor.

B. Common Fill Material: Common fill shall be sand and shall not contain stones, rock, concrete or 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 0-12

D. Class 1 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 sands 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 sands 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
3/8 inch	100
No. 10	85-100
No. 40	20-40
No. 200	0-12

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

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 the Owner.

3.02 EXCAVATION

A. General: Excavations for roadways, structures and utilities must be carefully executed in order to avoid interruption of utility service.

B. Excavating for Roadways/Structures/Utilities:

1. Excavation shall be made to such dimensions as will give suitable room for building the foundations and the structures, for bracing and supporting, for pumping and draining, and for all other work required.

a. Excavation for precast or prefabricated structures shall be carried to an elevation 2 feet lower than the proposed outside bottom of the structure to provide space for the select backfill material. Prior to placing the select backfill, the excavation shall be measured by the Engineer to indicate to the satisfaction of the Owner that the excavation has been carried to the proper depth and is reasonably uniform over the area to be occupied by the structure.

b. Excavation for structures constructed or cast in place in dewatered excavations shall be carried down to the bottom of the structure where dewatering methods are such that a dry excavation bottom is exposed and the naturally occurring material at this elevation leveled and left ready to receive construction. Material disturbed below the founding elevation in dewatered excavations shall be replaced with Class B concrete.

c. Footings: Cast-in-place concrete footing sides shall be formed immediately after excavation. Forming for footing sides is specified elsewhere.

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

3. 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.

4. Encounters with subsurface obstructions shall be hand excavated.

5. 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 the Engineer/R.P.R. at the Contractor's expense.

6. The bottom of excavations 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.

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

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

9. All locations and elevations as required herein must be permanently documented by the Contractor, on the Record Drawings prior to the Engineer's approval of the Application for Payment for that work.

10. When force main pipe is 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, whichever is greater.

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 without 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 within 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 his expense to excavate below grade and refill with crushed stone (gradation 57 or 89) or other approved fill material if the Engineer determines that adequate dewatering 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 the Contractor's excavation methods, he shall refill to normal grade with fill at his own cost. Fill material and compaction method shall be as directed by the Engineer.

3.05 FILL AND COMPACTION

A. Compact and backfill excavations and construct embankment according to the following schedule. (Proctor standard shall be ASTM D-698):

STRUCTURES AND ROADWORK

Area	Material	Compaction
Beneath Structures	Structural Fill	12" lifts, compacted to 95% maximum density as determined by AASHTO T-180. Fill should not be placed over any in-place soils until those deposits have been compacted to 95% Modified Proctor.
Around structures	Structural Fill	8" lifts, 95% of maximum density as determined by AASHTO T-180. Use light rubber-tired or vibratory plate compactors.
Beneath Paved Surfaces	Common Fill	12" lifts, 98% by maximum density as determined by AASHTO T-180 or as required by the FDOT Standards.
Open Areas	Common Fill	12" lifts, 95% by maximum density as determined by AASHTO T-180.

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 regulation 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 the Owner. Embankments shall be placed in successive layers of not more 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 area 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 the Owner. Approval will be considered only after the Contractor has performed tests, at the Contractor's expense, to identify the material used and density achieved throughout the backfill area utilizing the method of backfill requested. The Owner's approval will be in writing.

END OF SECTION

SECTION 02221 - TRENCHING, BACKFILLING AND COMPACTING

PART I - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals necessary to perform all trenching, removal of unsuitable or unsatisfactory material, backfilling and compaction for utilities required to complete the work shown on the Drawings and specified herein. The work shall include, but not necessarily be limited to, all trenching; all backfilling; compaction, disposal of waste and surplus materials; and all related work such as sheeting, bracing and dewatering.

B. The Contractor shall examine the site and review the available data prior to submitting his proposal, taking into consideration all conditions that may affect his work. The Owner and Engineer will not assume responsibility for variations of subsurface conditions.

C. The Contractor shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, for safety precautions and programs incident to the work and regulations, ordinances, codes and orders applicable to the furnishing and performance of the work.

RELATED DOCUMENTS

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

1.03 APPLICABLE PUBLICATIONS:

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

B. American Association of State Highway and Transportation Officials (AASHTO) Standards:

M145-82 The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes.

T180-74 Moisture-Density Relations of Soils Using a 10-lb. (4.54 kg) Rammer and an l8-inch (457 mm) Drop. (Modified Proctor Test).

T l91-61 Density of Soil In-Place by the Sand-Cone Method.
(R l982)

C. Florida Department of Transportation; "Standard Specifications for Road and Bridge Construction", (FDOT) l996 edition.

ASTM D2487: "Unified Classification System."

1.04 DEFINITIONS:

A. Common Fill: Common fill shall consist of any material classified as SW, SW-SM, SW-SC, SP, SP-SM, or SP-SC under Unified Classification System (ASTM D2487) which does not contain stones larger than 2 inches in any dimension and which has no more than 12 percent of its material by weight passing the No. 200 sieve.

B. Unsatisfactory Materials: Unsatisfactory materials shall be materials that do not comply with the requirements for common fill. Unsatisfactory materials include, but are not limited to, those materials containing roots and other organic matter, trash, debris, and stones larger than 2 inches, and materials classified in AASHTO M145 as groups A-2-4, A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7, A-7-5 and A-7-6. Unsatisfactory materials also include man-made fills, refuse, or backfills from previous construction.

C. Unyielding Material: Unyielding material shall consist of rock and gravelly soils with stones greater than 2 inches in any dimension, or maximum size stones as defined by the pipe manufacturer, whichever is smaller.

D. Unstable material shall consist of material without the sufficient bearing capacity to support the utility pipe conduit or appurtenance structure.

E. Select Common Fill: Select common fill shall meet the requirements for common fill specified above with the exception that select common fill shall not have more than 5 percent of its material by weight passing the No. 200 sieve. Also, the maximum allowable aggregate size for select common fill shall be 1 inch, or the maximum size recommended by the pipe manufacturer, whichever is smaller.

F. Degree of compaction: Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in AASHTO T180. Field verification will be obtained by the test procedure presented in AASHTO T191. The term "maximum density" shall mean the maximum density determined under AASHTO T180.

G. Bedding Rock: Coarse aggregate structural bedding and support for utilities appurtenances and structures equal to FDOT Number 57, or as required by pipe manufacturer’s recommendations for water mains.

1.05 PROTECTION

A. Prior to commencing trenching or dewatering, the Contractor shall take precautions to ensure that existing structures, which may be subject to settlement or distress resulting from trenching or dewatering are protected. Such precautions shall include establishing reference elevation markings on structures which are adjacent to new work and monitoring them to

ascertain evidence of settlement or distress throughout construction. If settlement or distress becomes evident, modifications to the trenching, dewatering or protection procedures shall be made to prevent additional settlement or distress and any damage caused to the structure shall be repaired at the Contractor's expense.

B. The Contractor shall furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of trenches, to prevent any movement which could in any way diminish the width of the trench below that necessary for proper construction, and to protect adjacent structures and other facilities from undermining or other damage. The stability of all excavated faces shall be maintained in compliance with the Occupational Safety and Health Administration's excavation safety standards, 29 C.F.R. S. 1926.650 Subpart P until final acceptance of the work. The Contractor shall also comply with all applicable requirements of the Florida "Trench Safety Act" (90-96, Laws of Florida), and all other applicable rules and regulations.

C. The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to remove all water entering trenches, and shall keep such trenches dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the utilities to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels. Dewatering shall be conducted in such a manner as to preserve the undisturbed bearing capacity and composition of the subgrade soils at the proposed bottom of the trench. Grading shall be done as may be necessary to prevent surface water from flowing into the trench, and any water accumulating therein shall be removed so that the stability of the bottom and sides of the excavations is maintained.

1.06 SUBMITTALS

A. Submit to the Owner for review, the proposed methods of construction, including dewatering, excavation, bedding, filling, compaction, and backfilling for the various portions of the work. Review shall be for informational purposes only. The Contractor shall remain responsible for the adequacy and safety of the methods.

1.07 SOIL TESTING

The Owner will employ the services of a testing laboratory to perform all soils testing.

B. The Owner shall have sole authority over the frequency of testing and shall direct the testing laboratory in its work. The Owner may order the excavation down to any depth of backfilled material which has not been tested and have a test performed. The Contractor shall excavate for the test and backfill after the test at no additional cost to the Owner. The Contractor shall re-excavate to the depth required and re-compact any areas found to be improperly backfilled.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Only common fill or select common fill, as defined above, may be used as backfill unless otherwise directed by the Owner.

PART 3 - EXECUTION

3.01 TRENCHING

A. The trench shall be excavated as recommended by the manufacturer of the pipe to be installed and as shown on Drawings. Trench walls below the top of the pipe shall be vertical to the extent possible to 1 foot above the proposed top of pipe. From 1 foot above the top of the pipe, trench walls shall be sloped 1:1 vertical to horizontal ratio. The maximum width of trench in the vertical pipe zone shell not exceed the pipe outside diameter plus a 9 inch allowance on each side of the pipe.

B. The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom half of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. The trench bottom shall be free from unyielding material. Where unyielding material is encountered in the bottom of the trench, such material shall be removed 4 inches below the required grade and replaced with select common fill compacted to minimum 95% AASHTO T-180.

C. Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select common fill or bedding rock as directed by the Owner.

D. Unless otherwise specified or indicated on the Contract drawings, pipe trenches shall be of a depth to provide a minimum cover of three (3) feet from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe. The pipe shall be buried a minimum of three (3) feet from the top of the pipe to the existing grade or three (3) feet below the proposed adjoining road surface grade, whichever results in the greatest depth.

3.02 DEMUCKING

A. The Contractor shall remove all muck in all areas where it is encountered. The muck shall be excavated to the depth required for complete removal, and disposed of at an approved dump site in accordance with all applicable rules and regulations. The Contractor shall notify the Owner if muck is encountered on the site.

3.03 MISCELLANEOUS EXCAVATION

A. The Contractor shall perform all the remaining miscellaneous excavation. The Contractor shall make all excavations necessary to permit the completion of the work as shown on the Drawings and specified herein.

3.04 BACKFILLING

A. Backfill material shall consist of common fill or select common fill as defined herein and as shown on the drawings. Backfill shall be placed in layers not exceeding 6 inches loose thickness for compaction by hand operated machine compactors, and 12 inches loose thickness for other than hand-operated machines, unless otherwise specified. Each layer shall be compacted to at least 95 percent of the maximum dry density as determined by AASHTO T180 for cohesionless soils unless otherwise specified. The bottoms of all excavations shall be compacted to at least 95 percent of the maximum density prior to backfill.

B. Trench Backfilling: For trenches, unyielding material removed from the bottom of the trench and unsuitable or unstable material removed from the trench shall be replaced with select common fill as specified. Replacement materials and backfill materials shall be select common fill and shall be placed in layers not exceeding 6 inches loose thickness from the bottom of the trench to 12 inches above the top of pipe. Backfill materials from 12 inches above the pipe to finished grade in unpaved areas and finished subgrade in paved areas shall be common fill placed in layers not exceeding 12 inches loose thickness. In unpaved areas, each layer of replacement material, or backfill material, shall be compacted to at least 95 percent of maximum density. In paved areas, each layer of replacement material, or backfill material, shall be compacted to at least 98 percent of maximum density. The bottoms of all trenches shall be in an undisturbed condition or, if disturbed, shall be compacted to at least 95 percent of maximum density to a depth of at least 1-foot below the trench bottom. Specified densities shall be as determined by AASHTO T180.

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

Remove and replace, or scarify and air-dry, soil material that is too wet to permit compaction to specified density.

2. Soil material that has been removed because it is too wet to permit compaction, but is otherwise satisfactory, may be stockpiled or spread and allowed to dry until moisture is reduced to a satisfactory value.

3.05 SURPLUS MATERIAL

A. Excavated material or borrow fill to be used in construction shall be neatly piled so as to inconvenience, as little as possible, the public and adjoining property owners until used or otherwise disposed of. Suitable excavated material may be used for fill, trench backfill or backfill on the different parts of the work as required. Surplus fill shall become the property of the Contractor, and shall be removed and disposed of by him off the site.

B. The Contractor shall remove and dispose of all pieces of rock (ledge) and boulders which are not suitable for use in other parts of the work. Rock disposed of by hauling away to spoil areas is to be replaced by approved surplus excavation obtained elsewhere in the work insofar as it is available. Any deficiency in the backfill material shall be made up with satisfactory material provided by the Contractor at no additional cost to the Owner. Rock may be used in embankment fill only with approval of the Owner.

C. The right is reserved to make minor adjustments or revisions in lines or grade, if found necessary, as the work progresses, due to discrepancies on the Drawings or in order to obtain satisfactory construction of utilities.

END OF SECTION

SECTION 02222 - EXCAVATING, BACKFILLING AND COMPACTING FOR UTILITIES

PART 1 - GENERAL

1.01 SCOPE OF WORK:

This section includes excavation, bedding, and backfilling for utilities necessary to perform all work necessary to prepare for laying the piping or main, including clearing, digging the trench, preparing the pipe bed, compacting, and preparing the surface restoration, and disposal of surplus material.

Maintain in operating condition existing utilities, active utilities, and drainage systems encountered in utility installation. Repair any surface or subsurface improvements shown on Drawings.

Verify location, size, elevation, and other pertinent data required to make connections to existing utilities and drainage systems as indicated on Drawings. Comply with permits and regulations according to General Conditions.

1.02 SUBMITTALS:

Shop Drawings or details pertaining to excavation and backfill are not required unless use of materials, methods, equipment, or procedures contrary to Drawings or these specifications are proposed. Do not perform work until required shop drawings have been accepted by Owner and Engineer.

1.03 JOB CONDITIONS:

Set all lines, elevations, and grades for utility system work and control system for duration of work, including careful maintenance of bench marks, property corners, monuments, or other reference points.

1.04 TRENCH SAFETY:

Care shall be taken to strictly observe all applicable, State, local and Federal standards with respect to the safety of persons during excavation and backfill. The contractor shall recognize OSHA excavation safety standards, agree to abide by them, and identify the costs to comply. The bidder, therefore, acknowledges that the total bid price includes costs for complying the Florida Trench Safety Act (90-96, Laws of Florida), effective October 1, 1990.

1.05 JACK AND BORE, DIRECT BORE CONSTRUCTION (IF APPLICABLE):

Jack and bore, direct bore construction shall be conducted in accordance with the Florida Department of Transportation Utilities Accommodation Guide.

1.06 TESTING:

Testing shall be conducted in accordance with AASHTO T-180, modified proctor density test. Tests shall be conducted on all trench backfill within 10 feet of pavement or proposed pavement areas and under all existing paved areas.

Frequency tests shall be conducted at each public roadway crossing and at no less than 300-foot intervals along the pipeline or on each pipeline run between manholes, inlets or junction boxes in accordance with these specifications. There shall be at least one test per layer placed.

Test report results shall be furnished to the Owner and Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Bedding Material

Processed sand and gravel free from clay lumps, organic, or other deleterious material, and complying with following gradation requirements:

U.S. Sieve Size	Passing by Weight, Percent
1 Inch	100
3/4 Inch	90-100
3/8 Inch	20- 55
No. 4	0- 10
No. 8	0- 5

PART 3 - EXECUTION

3.01 EXCAVATION, TRENCHING, AND BACKFILLING:

Performing excavation as indicated or specified depths. During excavation, pile materials suitable for backfilling in orderly manner far enough from bank of trench to avoid overloading, slides, or cave-ins.

Remove excavated materials not required or not suitable for backfill or embankments and waste as specified.

Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches or other excavations by pumping or other acceptable methods.

Open cut excavation with trenching machine or backhoe. Where machines other than ladder or wheel-type trenching machines are used, do not use clods for backfill. Dispose of unsuitable material and provide other suitable material at no additional cost to Owner.

3.02 TRENCH EXCAVATION:

Dig trench at proper width and depth for laying pipe, conduit, or cable. Cut trench banks as nearly vertical as practical and remove stones as necessary to avoid point-bearing. Over excavate wet or unstable soil, if encountered, from trench bottom as necessary to provide suitable base for continuous and uniform bedding. The amount of trench to be open at any one time shall be limited at the discretion of the Engineer to minimize public inconvenience and/or damage to life or property. Not more than 1,000' feet of trench shall be opened ahead of pipe laying operations, unless greater length of trench is approved by the Engineer.

All existing utilities such as pipes, poles and structures shall be carefully supported and protected from injury, and in case of damage, they shall be restored at no cost to the Owner.

Any pipes, conduits, wires, mains footings, or other underground structures encountered in trenching operations shall be carefully protected from injury or displacement. Any damage thereto shall be fully, promptly and properly repaired by the Contractor to the satisfaction of the Engineer and the Owner thereof.

Failure of the plans to show the exact location, nature or extent of any sub-surface obstruction shall not be the basis of a claim for extra work.

All trench excavation side walls greater than 5 feet in depth shall be sloped, shored, sheated, braced or otherwise supported by means of the sufficient strength to protect the workmen within them in accordance with the applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local ordinances. Lateral travel distance to and exit ladder or steps shall not be greater than 25 feet in trenches 4 feet or deeper.

Accurately grade trench bottom to provide uniform bearing and support for each section of pipe on undisturbed soil or bedding material at every point along entire length, except where necessary to excavate for bell holes, proper sealing of pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make joint connection properly.

The minimum width of the trench shall be equal to the outside diameter of the pipe at the bell plus six (6) inches on each side of the pipe. All other trench width requirements for pipe,

conduit, or cable shall be least practical width that will allow for proper compaction of trench backfill.

3.03 SHEETING AND BRACING:

Provide sheeting and bracing, when necessary, in trenches and other excavations where protection of workmen required. Sheeting may be removed after excavation has been backfilled sufficiently to protect against damaging or injurious caving.

3.04 PIPE BEDDING:

Accurately cut trenches for pipe or conduit that is installed to designated elevations and grades to line and grade 4" below bottom of pipe and to width as specified. Place 4" of bedding material, compact in bottom of trench, and accurately shape to conform to lower portion of pipe barrel. After pipe installation, place select backfill and compact in maximum 6" layers, measured loose, to at least 1'0" above top of pipe.

3.05 TRENCH BACKFILLING:

A. Criteria

Do not backfill trenches until required tests are performed, utility systems, as installed, comply with specified requirements, and are accepted by applicable governing authority. Backfill trenches as specified. If improperly backfilled, reopen to depth required to obtain proper compaction. Backfill and compact, as specified, to properly correct condition in an acceptable manner.

B. Backfilling

After pipe or conduit has been installed, bedded, and tested as specified, backfill trench or structure excavation with specified material placed in lifts or layers not exceeding 8" of loose material. Compact to minimum density of 95% of optimum density in accordance with ASTM D 698 or AASHTO T-99.

C. Compaction

Exercise proper caution when compacting immediately over top of pipes or conduits. Water jetting or flooding is not permitted as method of compaction.

D. Compaction Testing

Independent testing laboratory shall perform test at intervals not exceeding 300 feet of trench for each 12" of compacted trench backfill and furnish copies of test results as specified.

3.06 RESTORATION OF SURFACE:

The top surface of the trench fill shall be restored to the original or planned condition. Paved sections shall conform in grade to the adjacent area. Restoration shall be completed as promptly as practicable and shall not be prolonged until the end of the construction period.

3.07 DEWATERING:

If dewatering activity is required, unless specifically authorized by the Engineer, all pipe shall be laid "in the dry". The Contractor shall minimize the length of excavation in advance of pipe laying so as to minimize the amount of trench dewatering required. The Contractor shall dewater before trench excavation, utilizing one or more of the following approved methods: well point system, trench gravity underdrain system, or sumps with pumps.

Well point systems must be efficient enough to lower the water level in advance of the excavation and maintain it continuously in order that the trench bottom and sides shall remain firm and reasonably dry. The well points shall be designed especially for this type of service, and the pumping unit used shall be capable of maintaining of high vacuum, and at the same time, of handling large volumes of air as well as water.

If the material encountered at trench grade is suitable for the passage of water without destroying the sides or bottom of the main trench, sumps may be provided at intervals to the side of the main excavation, and pumps may be used to lower the water level by taking their suction from these sumps. In the event such pumps are employed, care shall be exercised to prevent the movement of pipe foundation material and to this end a bed of crushed stone may be required.

The Contractor shall be responsible for disposing of all water resulting from trench dewatering operations, and shall dispose of the water without damage or undue inconvenience to the work, the surrounding area, or the general public. He shall not dam, divert, or cause water to flow in excess in existing gutters, pavements, or other structures.

END OF SECTION

SECTION 02400 - SITE DRAINAGE

PART-1 - GENERAL

1.01 SCOPE OF WORK:

Installation and furnishing of all materials, equipment, and accessories to be used in the construction of the storm sewer and site drainage system.

1.02 STORM DRAINAGE STRUCTURES:

Pipe
Inlets, Manholes and Junction Boxes
Concrete Curb
Sidewalk

1.03 RELATED WORK:

Section 02222: Excavation, Backfilling, And Compacting For Utilities.

1.04 JOB CONDITIONS:

Set lines, elevations, and grades for drainage system work and control system for duration of work, including careful maintenance of bench marks, property corners, monuments, or other reference points.

PART-2 - PRODUCTS

2.01 PIPE USED SHALL MEET THE FOLLOWING SPECIFICATIONS::

Round Concrete Pipe or HDPE Pipe (over 12" in dia.) ASTM C76-70

PVC pipe (12" in diameter or less) ASTM D 3034

2.02 INLETS, MANHOLES AND JUNCTION BOXES:

Inlets, manholes and junction boxes shall be constructed of precast concrete or cast-in - place concrete. A maximum of 12 inches of brick risers may be used for precast units. If cast in place is used, no allowance for riser changes will be allowed with brick.

Concrete shall be Class I, as specified by the Florida Department of Transportation Standard Specifications for Road and Bridge Construction Latest Edition.

Mortar for brick masonry shall be of one (1) part portland cement to three (3) parts sand. Hydrated lime in an amount not to exceed ten percent (10%) of the amount of cement used may, at the Contractor's option, be added to the mortar. Masonry cement, delivered in packages properly identified with the brand name of the manufacturer and showing the net weight as well as whether it is Type 1 or Type 2, may be used in lieu of mixed mortar, provided it has not been in storage for more than six (6) months.

Grating and frames fabricated from structural steel shall be galvanized in accordance with the requirements of ASTM A123.

Forms may be of wood or metal construction, shall be constructed true to line and grade and shall be approved by the Engineer before being filled with concrete.

The Contractor may substitute precast inlets, manholes and junction boxes in lieu of cast-in-place units. Such precast units shall be in accordance with ASTM C478 or with Florida Department of Transportation Standards.

PART-3 - EXCAVATION

3.01 INLETS AND MANHOLES:

Excavation shall be in accordance with Section 02222 of these Specifications.

If the Contractor elects to construct units of cast-in-place concrete, the concrete shall be placed in the approved forms to the depths shown on the plans and thoroughly vibrated. After the concrete has hardened sufficiently, it shall be covered with suitable material and kept moist for not less than three days.

Reinforcing steel for cast-in-place construction shall be in place, securely tied and properly spaced prior to placement of the concrete.

After the concrete or mortar has cured, the frame of the casting shall be set in a full mortar bed composed of one part portland cement to two parts fine aggregate.
Inlet and outlet pipes shall be of the same size and kind as the connection pipe. They shall extend through the walls for a distance beyond the outside surface sufficient for the intended connections and the concrete constructed around them so as to prevent leakage along their outer surface. The inlet and outlet pipe ends shall be flush with the inside face of the wall.

Inlets, manholes and junction boxes shall be backfilled completely by use of mechanical tampers and in six-inch (6") compacted layers.

3.02 PIPES AND PIPE CULVERTS:

Trenches for pipe culverts, storm sewers, sanitary sewers, water lines and other conductors shall be excavated to the required depth and to a width sufficient to provide adequate working room. For pipe lines placed above the natural ground line, the embankment shall be placed and compacted to an elevation of at least two feet (2') above the top of pipe and at least four (4) pipe diameters each side of the pipe before excavating the pipe trench. It is the express intent of this specification that all pipes will be placed in trenches.

For all pipe culverts, storm sewers and sanitary sewers of 24 inches or more inside diameter the pipe bedding shall be shaped to conform to the outside of the pipe, for a depth of not less than ten percent (10%) of its total outside height and recesses provided to receive the bell. For pipes of less than 24 inches inside diameter, the trench bottom may be either flat or shaped to fit the pipe, except that the recesses for bells are required in any event. The pipe barrel shall be fully supported by the trench bottom.

Where rock, boulders or other hard, lumpy or unyielding materials are encountered in the trench bottom, they shall be removed to a depth at least twelve inches (12") below the bottom of pipe and the resultant excavation backfilled. Muck or other soft material considered by the Engineer to be unsuitable as foundation for the pipe shall be removed to the depth required to obtain a firm foundation and backfilled.

All pipes shall be carefully laid, true to line and grade, with hubs up-grade and the tongue end fully entered into the hub. When pipe with quadrant reinforcement, or circular pipe with elliptical reinforcement, is used the pipe shall be installed in a position such that the manufacturer's marks designating "top" and "bottom" of the pipe shall not be more than five degrees from the vertical plane through the longitudinal axis of the pipe. Any pipe which is not in true alignment or which shows any settlement after laying shall be taken up and re-laid without additional compensation.

For all round concrete pipe, other than side drain pipe, the pipe joints shall be sealed by use of round rubber gaskets. Those gaskets shall meet the requirements of Article 5.9 of ASTM C361. Pipe joints shall meet the requirements of Article 941-1.5 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Latest Edition. The gasket and joints shall be free of grit, dirt and other foreign matter at the time the joints are made. In order to facilitate closure of the joint, application of an approved vegetable soap lubricant immediately prior to closing the joint will be permitted. For concrete pipe used as side drain the joints shall be welded before the inside mortar is placed and before succeeding section of the pipe are laid, the lower half of the joint portion of the pipe in place shall be filled with cement mortar and the upper half of the tongue portion of the next joint wiped with cement mortar, both in sufficient thickness to bring the inner surface of the abutting pipe flush and even when the pipe is laid. After the pipe is laid, the inside of the joint shall be wiped and finished smooth and a mortar bead not less than 3/4 inches thick shall be formed completely around the outside of the joint.

For concrete pipe laid with rubber gasket joints, any deviation from true alignment or grade which would result in a displacement from the 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, the pipe shall be re-laid without additional compensation. Where minor imperfections in the manufacturing of the pipe causes a gap greater than 1/2 inch between pipe sections, the joint will be acceptable provided the gap does not extend more than 1/3 the circumference of the inside of the pipe. No mortar, joint compound, or other filler which would tend to restrict the flexibility of the gasket joint will be applied to the gap.

Corrugated steel pipe shall be field jointed with locking bands as specified by AASHTO M36-70. The joints shall be gasketed with a rubber or neoprene gasket of a design shown to secure a soil tight or water tight joint. The gasket for annular pipe joints shall be at least seven inches wide and at least 3/8 inch thick and at least one inch thick and at least one inch (1") and five inches (5") wide for helical pipe joints. Suitable alternate joints will be considered by the Engineer if the Contractor requests such consideration. Field joints for aluminum pipe except the material used in the bands and band connectors shall be of the same alloy as the culvert sheeting and shall meet the requirements of AASHTO M196.

Immediately prior to final inspection, coated corrugated steel pipe shall be cleaned and inspected for breaks or other damage to the coating or to the pipe itself and any repairs necessary shall be made by the Contractor. Grade required shall be cut down or extended and made to conform to the required grade.

PVC pipe laying shall proceed up grade with spigot ends pointing in the direction of flow. Before pipe is joined, gaskets shall be cleared of all dirt and stones and other foreign material. The spigot ends of the pipe shall be lubricated lightly with a lubricant specified by the pipe manufacturer and approved by the project engineer. Sufficient pressure shall be applied to the pipe so as to properly seat the socket in the bell of the pipe. All pipes shall be laid straight, true to the lines and grades shown on the plan.

Where manholes are to be raised, the adjustment may be made, if the Contractor so chooses, by the use of adjustable extension rings of the type which do not require the removal of the existing manhole frame. The extension device shall provide positive locking action and shall permit adjustment in height as well as diameter. The particular type of device used shall meet the approval of the Engineer.

3.03 CONCRETE CURB & SIDEWALK:

A. Concrete Curb

All concrete curb shall be constructed in accordance with the Florida Department of Transportation Standard Specifications of Road and Bridge Construction,

Section 520.

B. Concrete Sidewalk

This work shall consist of constructing cement concrete sidewalks in accordance with these specifications and within reasonable close conformity to the lines, grades and dimensions shown on the drawings established by the Engineer. Materials for sidewalk construction shall be 2500 psi, concrete and Class I (DOT) steel wire fabric AASHTO Designation M-55. The foundation for the bed shall be formed a depth of 4 inches below and parallel with the finished surface of the sidewalks, unless otherwise indicated on the drawings or specified. Unsuitable material shall be removed and replace with approved material, and the foundation shall be thoroughly compacted and finished to a firm, even surface. Edge dimensions shall conform to the plan details, with one #5 continuous bar on each side.

Forms shall be of wood or metal, straight, free form warp, and of sufficient strength when staked to resist the pressure of the concrete without springing. If wood, they shall be nominal 2-inch planks surfaced on the inside and the top; or if of metal, they shall be of approved section. Forms shall have a depth equal to the depth of the concrete and shall be thoroughly cleaned and oiled before concrete is placed against them. Forms that are worn, bent, or damaged shall not be used.

Sidewalks shall be constructed in separate slabs 15 feet in length except for closures. These slabs shall be separated by transverse premolded expansion joint filler, if an inch in thickness, for the full depth of the concrete. Transverse premolded expansion joint filler shall also be placed adjacent to existing structures where directed. The slabs between expansion joints shall be divided into blocks 5 feet in length, by scoring transversely. Where the slabs are more than 5 feet in width they shall be scored longitudinally in the center. Transverse and longitudinal scoring shall extend for a depth of at least the thickness of the concrete slab.

Premolded expansion joint filler, of an inch in thickness for the full depth of the concrete, shall be placed longitudinally where the sidewalk slab is to be constructed in contact with curbs.

Where existing light standards, poles, fire hydrants, and similar structures are within the limits of the sidewalk area, the concrete around such structures shall be scored in a block 8 inches wider than the maximum dimension of the structure at the sidewalk elevation. Prior to placing the concrete around such structures, premolded expansion joint filler, of an inch in thickness, shall be placed around the structure for the full depth of the concrete in the sidewalk.

The concrete shall be placed in the forms and tamped and spaded to prevent

honeycomb and until the tip of the structure can be floated smooth and the edges rounded to the radius shown in the plans. A light broom finish shall be applied once the concrete has set enough to be permanently marked.

Side forms shall not be removed within 12 hours after the concrete has been placed. After removal of the forms, minor honeycombed areas shall be filled with mortar composed of 1 part of cement and 2 parts of fine aggregate. Major honeycombed areas will be considered as defective work, and shall be removed and replaced at no expense to the Owner.

All expansion joints, and scoring cracks where required, shall be sealed with joint sealing material having ASTM designation D1190.

After the concrete has cured for a period of not less than 72 hours, the spaces adjacent to the sidewalk shall be backfilled with approved material in layers of not more than 4 inches in depth, which shall be thoroughly compacted mechanically to the required elevation and cross-section.

END OF SECTION

SECTION 02500 - ROADWAY BASE COURSE

PART 1 - GENERAL

1.01 SCOPE OF WORK:

Furnish and install roadway and parking area base course in accordance with the contract drawings and specifications.

REFERENCED PUBLICATIONS:

A. Florida Department of Transportation "standard specifications for road and bridge construction" latest edition, hereafter referred to as FDOT Standard Specifications.

RELATED SECTIONS:

Section 02200 – Earthwork
Section 02511 – Asphaltic Concrete Paving

PART 2 - PRODUCTS

2.01 Base course material shall be in accordance with FDOT Standard Specifications, Section 200, Limerock Base or Section 204, Graded Aggregate Base.

A. Limerock may be of either Miami or Ocala formation and shall meet the following requirements:

1) Minimum percentage of carbonates of calcium and magnesium in the limerock material shall be seventy (70) percent.
2) Maximum percentage of water sensitive clay material shall be three (3) percent by weight.
3) Maximum Liquid Limit shall not exceed thirty-five (35).
4) Plastic Index shall not exceed ten (10).
5) At least ninety-seven (97) percent of the material, by weight, shall pass a three and one half (3 1/2) inch sieve and the material shall be graded uniformly down to dust. All crushing or breaking-up, which is necessary to meet this requirement, shall be done before the material is placed on the roadbed.
6) Material shall not contain cherty or other extremely hard pieces, or lumps, balls or pockets of sand or clay size materials in sufficient quantity as to be detrimental to the proper bonding, finishing or strength of the limerock base.

2.02 PRIME COAT:

A. Materials

Unless otherwise called for on the plans or in Special Provisions, material used in the prime coat shall be Cut-Back Asphalt, Grade RC-70 or RC-250 or Emulsified Asphalt, Grade RS-2. Cutback Asphalt shall meet the requirements of AASHTO M81 except that the penetration range shall be 60-120 instead of 80-120. Emulsified Asphalt shall meet the requirements of AASHTO M140 (for anionic) and M208 (for cationic). The viscosity requirements for Grade RS-2 shall not apply. Other types and grades of bituminous material may be allowed if it can be shown that the alternate material will properly perform the function of prime coat material.

Cover material shall consist of a sand bituminous hot- mix containing from two (2) to four (4) percent Asphalt Cement, viscosity Grade AC-20 and fine aggregate consisting of a clean sand or screenings. Sand shall contain no more than ten (10) percent material by weight, passing the No.200 sieve. Screenings shall not contain any material retained on a three eighth (3/8) inch sieve and not more than ten (10) percent, by weight, passing the No.200 sieve.

PART 3 - EXECUTION

3.01 Equipment

Limerock shall be spread by mechanical rock spreaders equipped with a device to strike the rock off uniformly to laying thickness and capable of producing an even distribution of the rock. In areas where the use of a mechanical spreader is impractical, and with the approval of the Architect, limerock may be spread by means of a dozer or grader blade.

Hauling, Spreading And Compacting: As much as possible, rock shall be hauled over rock previously placed. Hauling over the subgrade is permitted, provided that any soft spots that develop in the subgrade as a result of that hauling shall be immediately repaired to the satisfaction of the Architect.

When the specified compacted thickness of the base is six (6) inches or less, the base shall be constructed in one (1) layer. For bases of greater than six (6) inch thickness, the base shall be constructed in two (2) or more layers, with the final layer approximately one-half (1/2) the total thickness, but in no case less than four (4) inches. Before compaction effort starts, all segregated areas of fine or coarse rock shall be removed and replaced with properly graded rock.

After the limerock has been spread, it shall be brought to the proper moisture content by wetting or drying. When water is added, it shall be uniformly mixed-in by disking to the full depth of the course which is being compacted. Wetting or drying operations shall be across the full width and the full depth of the course being compacted.

The limerock base for roadways shall be compacted to a density of not less than ninety-five (95) percent of the maximum density as determined by AASHTO T180. Limerock base for shoulder

paving or under sidewalks or driveways shall be compacted to a density of not less than ninety-five (95) percent of the maximum density as determined by AASHTO T180.

Density tests shall be made on each day's final compaction operation on each course. The frequency of those tests shall be as specified herein. All bladeing, manipulation or other operations shall be complete prior to performing the tests.

If, at any time, subgrade material should become mixed with the base material, the contaminated base material shall be removed and replaced with suitable material. If the subgrade has been affected to the degree its integrity is questionable, then that subgrade shall be replaced as well.

3.02 FINISHING BASE:

Limerock base shall be finished to true line, grade and cross-section. As soon as the finishing operation is complete the finished surface shall be checked with a template cut to the required cross-section and with a fifteen (15) foot straightedge laid parallel to the road. The straightedge shall be placed in alternating overlaps to assure complete coverage. Any straightedge shall be placed in alternating overlaps to assure complete coverage. Any irregular ties greater than three eighths (3/8) inch shall be corrected by scarifying and removing or adding rock as needed after which the area shall be re-compacted and re-tested.

Thickness of base shall be measured at the intervals as specified herein. Base which is deficient by more than five (5) percent of its planned thickness shall be corrected by scarifying, adding rock, reshaping and recompacting for a distance of one hundred (100) feet each side of the edge of the deficient area. As an exception to this requirement, where only one area is deficient and that area is less than twenty (20) feet long, or less than one (1) percent of the total day's base work, whichever is smaller, then the Architect may waive the requirement for reconstructing the area providing the deficiency is less than ten (10) percent of the planned thickness.

3.03 APPLICATION OF PRIME COAT:

Before any bituminous material is applied, all loose material, dust, caked clay, dirt and other foreign material which might prevent proper bond with the existing surface shall be removed for the full width of the application.

Bituminous material shall be applied by pressure distributor equipped with pneumatic tires having a sufficient width of rubber in contact with the road surface to avoid breaking the bond or forming a rut in the surface. The outside nozzle at each end of the spray bar shall have an opening of not less than twenty-five (25) percent nor more than seventy-five (75) percent in excess of the interior nozzles. All other nozzles shall have uniform

openings and shall be spaced so as to provide an even distribution of the bituminous material on the surface.

The surface to be primed shall be lightly sprinkled with water and rolled with a traffic roller immediately before applying the bituminous material.

The moisture content of the base material shall not exceed ninety (90) percent of the optimum moisture of the material at the time the prime material is applied. The bituminous material shall be applied by a pressure distributor at a temperature between 100 degrees F. and 150 degrees F., that will insure even distribution.

The rate of application shall be not less than 0.10 gallon per square yard. Sand-bituminous hot-mix shall be applied at the rate of ten (10) pounds of mix per square yard.

The entire surface, after covering, shall be rolled with a traffic roller to obtain a reasonable dense mat.

3.03 FIELD QUALITY CONTROL:

An Independent Testing Laboratory approved by the Owner and paid by the contractor, shall be retained to perform construction testing on site except as may be amended in the supplemental conditions.

Fill Placed in Areas to be Paved: At least one compaction test of every 2,000 sq. ft. of each eight (8) lift or layer.

If compaction requirements are not complied with at any time during construction process, remove and recompact deficient areas until proper compaction is obtained at no additional expense to Owner.

The following tests shall be performed on each type of material used as compacted fill as part of construction testing requirements:

Moisture and Density Relationship: ASTM D 698.
Mechanical Analysis: AASHTO T-88.
Plasticity Index: ASTM D 424.

Field density tests for in-place materials shall be performed according to one of the following standards as part of construction testing requirements.

Sand-Cone Method: ASTM D 1556.
Nuclear Method: ASTM D 2922.

Base course construction testing shall be performed as follows:

Base Material Thickness: Perform one test for each 8,000 sq. ft. in-place base course.

Base Course Compaction: Perform one test for each 2,000 sq. ft. of in-place course.

Test each source of material for base course in accordance with applicable state highway specifications.

Owner, Engineer and Contractor shall be provided with copies of reports within twenty-four (24) hours of time test was performed.

In event that any test performed fails to meet these Specifications, Owner and Contractor shall be notified immediately by Independent Testing Laboratory.

Owner reserves right to employ Independent Testing Laboratory and to direct any testing that is deemed by Owner to be necessary. Contractor shall provide free access to site of testing activities.

END OF SECTION

SECTION 02511 - ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.01 SCOPE OF WORK:

Furnish and install asphaltic concrete paving, including prime and tack coat in accordance with the contact drawings and specifications.

1.02 REFERENCED PUBLICATIONS:

A. "Standard Specifications for Road and Bridge Construction," Florida Department of Transportation (latest edition), hereafter referred to as "FDOT Standard Specifications"

1.03 RELATED SECTIONS:

Section 02500 – Roadway Base Course

1.04 SUBMITTALS

A. Design Mix:

Before any asphalt surface is constructed, the Contractor shall submit actual design mix for asphalt to the Project Manager for acceptance.

B. Material Certificates:

Furnish copies of materials certificates signed by material producer and Contractor certifying that each material item complies with, or exceeds, specified requirements.

1.04 JOB CONDITIONS

A. Weather Limitations:

Apply prime and tack coats when ambient temperature is above 50 percent, and when temperature has not been below thirty-five (35) degrees for twelve (12) hours immediately prior to application. Do not apply when base is wet or contains excess moisture.

Construct asphalt concrete surface course when atmospheric temperature is above forty (40) degrees and when base is dry. Base course may be placed when air temperature is above thirty (30) degrees and rising.

B. Grade control:

Establish and maintain required lines and elevations.

PART 2 - PRODUCTS

2.01 ASPHALTIC CONCRETE

This section specifies the material, the compositions, and the job mix formula for Type S asphaltic concrete pavements as specified in Section 331 of the Standard Specifications. The requirements for plant and equipment for these pavements are specified in Section 320 of the FDOT Standard Specifications. The Contractor shall submit a job mix formula as required by FDOT Standard Specification, Section 331.4.3, prior to the start of production.

2.02 PRIME AND TACK COAT

Governing specifications for materials shall be as per FDOT Standard Specifications, Section 300, Prime and Tack Coats for Base Courses.

PART 3 - EXECUTION

3.01 PREPARATION

Remove loose material from compacted base surface to check for unstable areas and areas requiring additional compaction. Do not begin paving work until deficient base areas have been corrected and are ready to receive paving.

3.02 PRIME COAT

Apply bituminous prime coat to base surfaces where asphaltic concrete paving will be constructed.

Apply bituminous prime coat in accordance with FDOT Standard Specification, Section 300-6.

Apply at minimum rate of 0.20 to 0.50 gal./sq. yd. over compacted base. Apply material to penetrate and seal, but not flood, surface.

Cure and dry as long as necessary to attain penetration and evaporation of volatile.

3.03 TACK COAT

Apply to contact surfaces of previously constructed asphalt or portland cement concrete and surfaces abutting or projecting into asphalt concrete and surfaces abutting or projecting into asphalt concrete pavement.

Apply tack coat to full depth asphalt and sand asphalt base. Apply emulsified asphalt tack coat between each lift or layer of full depth asphalt and sand asphalt bases and on surface of such bases where asphaltic concrete paving will be constructed.

Apply emulsified asphalt tack coat in accordance with FDOT Standard Specification Section 300-7.

Distribute at rate of 0.05 to 0.15 gal./sq.yd. of surface.

Allow tack coat to dry until at proper condition to receive paving.

3.04 PLACING MIX

Place asphalt concrete mixture on prepared surface, spread, and strike off. Spread mixture at following minimum temperatures:

When ambient temperature is between forty (40) degrees F and fifty (50) degrees F: Two hundred eight-five (285) degrees F.

When ambient temperature is between fifty (50) degrees and sixty (60) degrees F: Two hundred eighty (280) degrees F.

When ambient temperature is higher than sixty (60) degrees F. Two hundred seventy-five (275) degrees F.

Place inaccessible and small areas by hand. Please each course to required grade, cross-section, and compacted thickness.

3.05 PAVER PLACING

Place in strips not less than 10'-0" 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 section before placing surface course.

3.06 JOINTS

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

3.07 ROLLING

Begin rolling when mixture will bear roller weight without excessive displacement.

Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

3.08 BREAKDOWN ROLLING

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

3.09 SECOND ROLLING

Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

3.10 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.

3.11 PATCHING

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

3.12 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.

3.13 FIELD QUALITY CONTROL

Independent Testing Laboratory, selected and paid by Contractor, shall be retained to perform construction testing of in-place asphalt concrete courses for compliance with requirements for thickness and surface smoothness. Asphalt surface and base course shall be randomly cored at a rate of one core for every 20,000 square feet of paving. However, no less than three cores in light duty areas and three cores in heavy-duty areas shall be obtained. Asphalt pavement samples shall be tested for aggregate gradation and bitumen content for conformance with the mix design. The asphalt pavement shall also have Extraction and Marshall Stability tests taken on the material placed each day. Density of asphaltic concrete surface course shall be 93 percent of job mix Marshall Laboratory density.

ACCEPTANCE OF MIXTURE

Plant Mixture

1. Acceptance of the bituminous mixture at the plant will be based on the Contractor's testing lab results. Asphalt must meet a minimum Marshall Stability of 1500 lbs. Extraction and Gradation results shall meet the variance acceptable values provided in Table 331-6. One sample shall be tested in the morning and one in the afternoon for each day's paving.

Any load or loads of mixture, which in the opinion of the Project Manager or Owner are unacceptable due to being segregated, aggregates improperly coated, or an excessively high or low temperature, shall be rejected for use in the work. The Owner may reject the asphalt or direct the Contractor to remove the asphalt due to failure to meet any F.D.O.T. requirements.

Field Density Requirements

Field density requirements shall conform to F.D.O.T. – Section 330-10.3.

3.15 THICKNESS

In-place compacted thickness shall not be less than thickness specified on the drawings.

3.16 SURFACE SMOOTHNESS

Test finish surface of each asphalt concrete course for smoothness, using 10'-0" straightedge applied parallel with, and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding following tolerances for smoothness:

Base Course Surface: 1/4"
Wearing Course Surface: 3/16"

Check surface areas at intervals necessary to eliminate ponding areas.

Repair or remove and replace unacceptable paving as directed by Owner.

Areas of deficient paving thickness shall receive a minimum 3/4" overlay until specified thickness of the course is met or exceeded.

END OF SECTION

SECTION 02520 - SITEWORK CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Construction of concrete curb and gutter, concrete valley gutters and sidewalk, as shown on the Drawings and as herein specified.

B. Related Work Specified Elsewhere

1. Section 02221: Trenching, Backfilling and Compacting

C. Supplementary Specifications

1. All Florida Department of Transportation Standard Specifications for Road and Bridge Construction - 1991 (FDOT Standard Specs) herein referred to and/or herein amended form a part of these technical specifications.

1.02 QUALITY ASSURANCE

A. Qualifications of Installer

1. At all times during execution of this portion of the work, provide at least 1 person who is thoroughly familiar with the type of materials being installed and is directly responsible for all work performed under this section.

B. Quality Control Requirements

1. Requirements shall be as set forth in other related specifications as herein referred to.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete

1. All work under this section shall be of Class II concrete, as set forth in FDOT Standard Specifications.

B. Steel

1. All reinforcing steel shall be Grade 60 Reinforcement, in accordance with the provisions set forth in FDOT Standard Specifications Section 415 "Reinforcing Steel".

C. Joint Materials

1. All joint materials shall be in accordance with the provisions set forth in FDOT Standard Specifications Section 932-1 "Joint Materials".

PART 3 - EXECUTION

3.01 CONSTRUCTION

A. Concrete Gutter, Curb Elements and Traffic Separator

1. Concrete curb and gutter and concrete valley gutter construction shall be in accordance with FDOT Standard Specifications 520 "Concrete Gutter, Curb Elements and Traffic Separator", except as hereinafter amended and as shown on the Drawings.

B. Concrete Sidewalks

1. Construction shall be in accordance with FDOT Standard Specifications Section 522 "Concrete Sidewalk", except as hereinafter amended and as shown on the Drawings.

END OF SECTION

02577 - PAVEMENT MARKINGS

PART-1 - GENERAL

1.01 SCOPE OF WORK:

Furnish all tools, equipment, materials, machinery, appurtenances and labor, unless otherwise specified to establish all pavement markings for fire lanes, lane striping, parking, stall striping, handicapped symbols and other necessary striping for traffic control and public safety.

The Contractor shall maintain access for vehicular and pedestrian traffic as required for other construction activities.

Flagman shall be utilized, where necessary, along with barricades, warning signs, and warning lights.

1.02 RELATED WORK

Florida Department of Transportation Standard Specifications for road and bridge construction latest edition (referred to herein as "Standard Specifications").

PART-2 - PRODUCTS

2.01 MATERIALS:

The paint utilized for striping shall be Thermoplastic compound meeting AASHTO M 249-79 as detailed in Section 711-2 of the Standard Specifications. The paint colors shall be selected as follows:

Exterior Sidewalk Curbs:	Yellow (Per D.O.E.)
Lane Striping:	White
Handicapped Symbols:	Blue
Parking Stall Striping:	White

PART-3 - EXECUTION

3.01 PREPARATION:

Application surface shall be swept and cleaned to eliminate loose materials and dust per Section 710-6.3 of the FDOT Standard Specifications.

3.02 APPLICATION:

All paint shall be applied in accordance with the manufacturer's recommendations and Section 711-4 of the FDOT Standard Specifications.

Paint shall be applied with mechanical equipment to provide uniform and straight edges.

END OF SECTION

SECTION 02820 - GRASSING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section shall govern the furnishing of all sod, labor, materials, equipment and services necessary for the complete installation of all sodding and other items necessary to complete the work as shown on the Drawings and as specified herein.

B. Unless otherwise indicated, the Contractor is responsible for the repair of any existing lawn areas disturbed during the construction process

C. The Contractor is responsible for the irrigation of all lawn areas on the project, including those not covered by an irrigation system.

D. The Contractor is responsible for the all maintenance to the Bermuda grass lawns during a minimum 2-month grow in period.

1.02 GENERAL REQUIREMENTS

A. See Drawings for area to be sodded.

B. Labor crews shall be directed by a landscape foreman experienced in plant materials, planting, reading blueprints, and coordination between job and nursery.

C. Coordinate work with other related work in order to expedite installation of work.

1.03 BERMUDA GRASS FIELD INSTALLER QUALIFICATIONS

A. A contractor specializing in the grading and grassing of athletic fields shall grade and install the Bermuda grass field. The specialty contractor shall submit a list of athletic field projects successfully completed during the past three years, including a list of three similar Bermuda grass sports field projects for the approval of the Landscape Architect and the Owner. Include information concerning the project Owner and references with telephone contact numbers.

1.04 APPLICABLE DOCUMENTS

A. The following publications of the issues listed below form a part of this Specification.
   1. American Joint Committee on Horticultural Nomenclature AJCHN) Standard Plant Names, Second Edition (1942).
   2. American National Standards Institute (ANSI)-Z60.1-2004 Nursery Stock (sponsored by the American Association of Nurserymen, Inc.)
   3. Grades and Standards for Nursery Plants, Parts I and II, State Plant Board of Florida.

1.05 SUBMITTALS

A. Provide submittals per contract documents.

B. Provide submittals for the following products for the Landscape Architect's approval of prior to start of work on the sodding.
   1. Fertilizer
   2. For all Bermuda grass fields, submit planting soil analyses of the existing and imported soils for approval at no additional cost to the Owner. If the soil composition within the field area is uniform, collect cores for a composition sample from approximately six dispersed areas and within the top 6" of the soil. The analysis shall show % of organic material in the soil through the loss on Ignition by Volume soil test method, indicate the soil pH and with recommendations from the testing laboratory for additional topsoil, fertilizer type and application rate, and other soil amendments necessary to bring the top 6" of soils in the Bermuda grass areas to the following specified levels:
      a. Percolation rate: minimum 4" per hour in the top six inches of soil
      b. PH level: 6.0 - 7.0
      c. Soil Organic Content 5% minimum /20% maximum
      d Major and Minor nutrients as recommended by the laboratory
      e. A Florida agricultural testing laboratory acceptable to the Landscape Architect and the Owner shall perform all testing and recommendations.
   3. Herbicides
   4. Fire ant certification from the sod supplier
   5. Specialty grading and grassing contractor information as noted in Section 1.03 above.

C. Operation Data: Submit for continuing Owner maintenance.

D. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height, types, application frequency, and recommended coverage of fertilizer.

PART 2 - MATERIALS

2.01 TOPSOIL

A. If the quantity of existing stored or excavated topsoil is inadequate for sodding, sufficient additional topsoil shall be furnished. Topsoil furnished shall be a natural, fertile, friable soil, possessing characteristics of representative productive soils in the vicinity. It shall be obtained from naturally well-drained areas . Topsoil shall be without a mixture of subsoil and free from Johnson grass (Sorghum halepense), nut grass (Cyperus rotundas) and objectionable weeds and toxic substances.

2.02 LIME

A. Shall be ground limestone (Dolomite) containing not less than 85% of total carbonates, and shall be ground to such a fineness that 50% will pass a 100-mesh sieve and 90% will pass a 20-mesh sieve.

2.03 FERTILIZER

A. Commercial fertilizer shall be 8-8-8 form ulation for all Bahia sod, of which 60% of the nitrogen is in the urea-form aldehyde form and shall conform to the applicable State Fertilizer laws. It shall be granulated so that 80% is held on a 16-m esh screen, uniform in composition, dry and free-flowing.

B. Fertilizer for Bermuda grass shall be 15-5-15 with the rate and minor nutrients as recommended by the agricultural laboratory performing the tests on the project topsoil.

2.04 SOD

A. Shall be Tifway 419 Bermuda and Argentine Bahia as noted on the Drawings. Sod shall be fresh, healthy, living stems (stolons or rhizomes) with 50% or more of the stems being rhizomes) and attached roots. Sod shall be obtained from approved sources where the sod is heavy and thickly m atted and free from ground pearl and fairy ring. The soil depth shall be uniform and 1"-1 1/2" thick. Sod shall be free of nut grass (Cyperus rotundas), Johnson grass (Sorghum halepense), and other objectionable weeds, and shall not contain material that might be detrimental to the development of the turf.

2.05 REQUIREMENTS:

A. All areas within the lim its of work indicat ed for sodding and all areas disturbed by the Contractor's operations, shall be grassed (sodded).
B. All Tifway 419 Bermuda shall be installed from rolled material.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Grading: Areas to be grassed shall be graded to rem ove depressions, undulations, and irregularities in the surface before grassing.

B. Tillage: When it is determined by a Landscape Architect that the soil conditions warrant special attention, the area to be grassed sha ll be thoroughly tilled to a depth of 3" using a plow and disc harrow or rotary tilling m achinery until a suitable seed bed has been prepared and no clods or clumps remain larger than 1"-1 1/2" in diameter.

C. Applying Lime: The pH of the soil sha ll be determ ined. If the pH is below 5.0, sufficient lime shall be added to provide a pH between 5.5 and 6.5. The lim e shall be thoroughly incorporated into the top three to f our inches of the soil. Lim e and fertilizer may be applied in one operation.

D. Applying Fertilizer:

1. For all Bahia sod, fertilizer shall be applied at the rate of 10 pounds per 1,000 sq. ft. and shall be broadcast over the surface after the sod has been placed. The rate of application for Bermuda grass shall be as recommended by the agricultural testing laboratory. Uniformly apply the fertilizer over the area receiving grass by using an approved distribution device calibrated to distribute the appropriate quantity. Do not fertilize when the wind velocity exceeds 15 miles per hour.
2. Fertilize Bahia sod 30 days after installation, and request an inspection to verify the application of the fertilizer.
3. Fertilize Bermuda sod both 30 and 60 days after installation, and request an inspection to verify the application of the fertilizer.

E. Fumigation of the Bermuda Grass Lawn Areas: The Contractor shall fumigate the lawn areas receiving Bermuda grass to eradicate all soil organisms, all existing vegetation is, and all plant seeds and other forms of plant regeneration. The Contractor shall use a soil fumigation method that guarantees all vegetative matter and soil organisms in the soil are eradicated. Use all soil fumigants and other materials as specified and recommended by the manufacturer(s).

F. Fine Grading:
1. After removal of debris, perform fine grading as required to bring all areas to receive grass to a smooth, even, and finished grade. Use a laser grader to fine grade areas receiving Bermuda grass. Fine grade other areas receiving grass by raking to eliminate wind rows, ridges, depressions and other irregularities. The Contractor shall fine grade areas receiving sod as necessary to achieve a finished grade (top of the sod) as specified in this section.
2. All sodded areas bordered by sidewalks, asphalt pavement, or curbs shall have a finished grade (top of the sod's soil) that is flush (or less than ½" below) with the grade of the adjacent sidewalk, asphalt pavement, or curb.
3. All sodded areas bordered by planting areas shall have a finished grade (top of the sod's soil) that is 1½" above the soil level in the adjacent planting bed.

G. Sodding: Sod shall be placed within 48 hour s of harvesting. In addition sod shall not be left stacked or rolled for longer than 24 hours.

H. Placing Sod:
1. The soil shall be soaked just prior to placi ng sod. Each block or strip of sod shall be butted firmly against the last. Gaps shall be filled with pieces of sod and topsoil. The sod shall not be stretched while placing. Immediately after placing sod, roll to provide firm contact with soil.
2. Place Bermuda grass sod field as required to produce a smooth and even surface conforming to the grades indicated on the project civil engineering plans. All field areas shall be laser graded as required to produce the required surface finish. The Contractor shall ensure that the finished grade of sod does not vary more than ¼" from a 10' long straight edge. Remove any mesh backing on the Bermuda grass from the sod and from the project site.

I. Watering: Sodding will not be authorized unless the planting soil has a moisture content level sufficient to prevent the immediate drying out of newly placed sod. Water shall be applied prior to sodding operations. At least one-half inch of water shall be applied uniformly to all areas to be sodded. In addition, watering will be required over all areas on which sodding has been completed. This application shall be made not later than 30 minutes after sodding has been completed and shall amount to at least one-half inch of water over the entire area sodded. Watering shall be done in a manner which will prevent erosion due to the application of excessive quantities in a concentrated area. Water source shall be provided by the Owner.

J. Winter Cover: All areas to be grassed shall be protected against erosion at all times. For protection during winter months, Italian rye grass shall be planted at the rate of four pounds per 1000 sq. ft. on all areas which are not protected by permanent grass.

K. Clean-Up: All excess soil, excess grass materials, stones, and other waste shall be removed from the site daily and not allowed to accumulate. All paved areas shall be kept clean at all times.

L. Maintenance shall begin immediately following the last operation of sodding and continue until final acceptance. Maintenance shall include watering, mowing, edging, replanting, and all other work necessary to produce a uniform stand of grass. Grassing will be considered for final acceptance when the permanent grass is healthy and growing on 100% of area to be sodded.

3.02 QUALITY CONTROL

A. Contractor quality control shall apply to all work in this Section in accordance with the provisions of Division I, General Requirements. Except where specifically testing, and approval shall be performed by the Contractor's quality control representative or a member of his staff. Where it is specified that a submission be made to others for approval, the CQC representative shall check the submission and satisfy himself that it complies with contract requirements prior to submission to others for approval.

3.03 CONTRACTOR'S RECORD OF CERTIFICATION

A. Contractor's records of certification will be required for the following, and three copies each of all documentation shall be furnished the Owner for record purposes:
   1. Certificate of Conformance will be required for the following:
      a. Sod
      b. Fertilizer
      c. Topsoil
      d. Lime
   2. Test Reports: The results of laboratory tests performed on the topsoil material shall be submitted. The reports shall include the pH level, the amount of organic matter, and available phosphoric acid and potash of the soil intended for use in the work.

3.04 REQUEST FOR FINAL ACCEPTANCE

A. The Contractor shall submit to the Owner or his Representative two copies of a written request for final acceptance of the grassing work. The request shall be submitted at least ten days prior to the anticipated date of acceptance. The condition of the grass will be noted, and the Contractor will be notified if maintenance is to continue.

3.05 GUARANTEE AND REPLACEMENT

A. All sod shall be guaranteed for a period of thirty (30) days from the time of job acceptance.

B. Replacement of sod necessary during the maintenance period shall be the responsibility of the Contractor, except for possible replacements of sod due to theft, vandalism, and neglect by Owner or acts of negligence on the part of others.

C. At the end of the guaranty period, and at any time during the period, any sod that dies or is not in satisfactory condition, as determined by the Owner and the Landscape Architect, shall be removed and replaced with new, healthy material of the original. The new material shall be guaranteed as outlined above. The Landscape Contractor shall be responsible for the cost of the material and labor.

D. The time limit may be extended by agreement for any material in questionable condition at the end of the guaranty period.

END OF SECTION

SECTION 02900 - IRRIGATION

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section shall govern the furnishing of all labor, materials, and equipment for a complete operating system for lawn irrigation as specified herein and shown on the applicable drawings.

1.02 SUBMITTALS

A. Material List: Submit a clearly legible list of all materials and equipment for irrigation system to Landscape Architect/Owner for approval prior to beginning construction.

B. Maintenance Items: Provide the following:
1. Two sets of sprinkler wrenches for adjusting, cleaning or dis-assembling each type of sprinkler.
2. Two service manuals for all equipment installed. Manuals shall be loose leaf and show drawings or exploded views of equipment and catalog numbers and current prices.
3. Operating instructions for all equipment installed.

C. Project Record Documents: Correct daily to indicate changes from Contract Documents.
1. Horizontally at 90 degree angles, dimension the location of the following items from two permanent points of reference, i.e. curb junctures, light standards, building corners, survey hub points, or coordinates with a tolerance of 12 inch maximum.
Sprinkler main lines routing.
Connections to the existing water supply lines.
Sprinkler control valves.
Gate valves.
Electrical control wire path diagrammatically.
2. Vertical dimensions shall be given for mains when site conditions require installation deeper than 24 inches.

1.03 PRODUCT HANDLING

A. Exercise care in handling, loading, unloading and storing irrigation system materials to avoid damage. Store under cover.

1.04 PROJECT CONDITIONS

A. The Contractor shall make all temporary repairs as necessary to keep installed/existing portions of the irrigation system in operating condition. This exercise shall not affect the requirements to be performed under the Contract Documents.

B. Coordinate work with that of other trades, all underground improvements, the location and planting of specimen trees and all other planting. Location of all planting requiring excavations 24 inch in diameter and larger shall be verified with Owner prior to installation of mainlines.

1.05 INSPECTION

A. Verify dimensions and grades at Job Site.

B. Contractor shall make himself/herself completely familiar with all site conditions, including all underground utilities. Submittal of bid shall be proof that Contractor accepts existing site conditions.

PART 2 - MATERIALS

A. Plastic pipe: Extruded from 100% American made Virgin Polyvinyl Chloride (PVC).
   1. Tie into existing mainline. Contractor shall repair and/or replace existing mainline as required due to damage from new construction.
   2. Plastic pipe (mainline) installed on pressure side of valves: (PVC) ASTM D1785, Schedule 40, or (PVC) ASTM D2241 Class 200 or as noted on details. All pressurized pipe shall be purple indicating reuse water.
   3. Plastic pipe installed on non-pressure side of valves: (PVC) ASTM D2241 Class 160.
   4. No “Bell” or “Slip” pipe, or any pipe designed to be joined without a fitting will be permitted on mainline or lateral line except 4” mainline shall be PVC (as noted above) ring joint type with ductile iron fittings.

C. Plastic Fittings: (PVC)1120 ASTM D1785, Type 2, IPS, Schedule 40, NSF.

D. Solvent & Cleaner: As recommended by pipe manufacturer.

E. Automatic Controller: Refer to Drawings.

F. Sprinkler Heads: Refer to Drawings.

G. Wire: Hunter ID1PUR 14 AWG/2.08 mm^2 solid core twisted pair as required.

H. Remote Control Valve Boxes: Ametek 12”x18” Rectangular with purple locking lids. Box lids shall be marked "R.C.V.".

1. Valve boxes for gate valves 3" and smaller: Ametek 10" round with locking lid, extensions as needed.
2. Gate valve box lids shall be purple locking lids and perm anently marked "Irri. Gate" or "Water".

I. Conduit for Control W ires (if s hown on drawings): (PVC) ASTM D1785, Schedule 40 in locations as indicated.

J. Miscellaneous Materials: As hereinafter specified and as necessary to com plete this work and as shown on Drawings.

PART 3 - EXECUTION

3.01 EXCAVATION AND BACKFILLING

A. Trenching - General:
1. Dig trenches straight.
2. Provide continuous support of the pipe by the bottom of trench. Lay pipe to even grade. Bottom of trench shall be free from rocks or other sharp edge objects.
3. Trenching shall follow layout indicated.
4. Minimum cover: Pressure Lines: 24 inches
Non-pressure Lines: 18 inches
Control wires: 30 inches
5. All lines shall have a 6" minimum clearance from each other and from lines of other crafts. Do not install lines directly over another line.
6. Maintain 1" minimum between lines which cross at angles of 45 degrees to 90 degrees.
7. Exercise care in excavating, trenching and working near existing utilities.

B. Backfilling:
1. Compact to dry density equal to adjacent undisturbed soils.
2. Conform to adjacent grades without dips, sunken areas, hum ps or other irregularities.
3. Initial backfill on plastic lines shall be pulverized native soil no larger than 2" in diameter and free of foreign matter.
4. Restore grades and repair damage where settling occurs.

C. Routing of Piping:
1. Pressure and non-pressure piping lines are routed diagram matically on Drawings.
2. Coordinate specimen trees and shrubs with routing of lines. Planting shall take precedence over sprinkler and piping location. Report any m ajor deviation from routing indicated to Landscape Architect or Owner.
3. Install lines in such m anner as to c onform to the Drawings without offsetting the various assemblies from the pressure supply line.

3.02 INSTALLATION

A. Water Supply: Connect to water sources indicated.

In the event that a well is used as th e water source for the irrigation system , the Landscape Contractor shall be responsible for obtaining water sam ples from the well. At the Landscape Contractor's expense, he shall have a certified lab analyze the water quality. The Landscape Contractor shall report to the Landscape Architect or Owner's Project Ma nager, any potential issues that m ay affect the health of the plant m aterial or potential staining to sidewalks and buildings. Reporting shall occur before the system is installed. Failure to report shall place liability on the Landscape Contractor.

B. Cathodic Protection: Provide in th e piping systems where required by installing insulating couplings, flanges or unions be tween copper or brass pipe or tubing and steel or cast iron pipe.

C. Plastic Pipe: Install plastic pipe in accord with manufacturer's recommendations. Install sprinkler head on plastic pipe as indicated.
   1. All welded joints shall be cleaned with m anufacturer's cleaner prior to applying solvent.
      a. Welded joints shall be given at least 15 m inutes set-up curing time before moving or handling.
      b. Pipe shall be partially center load ed to prevent arching and shifting under pressure.
      c. No water shall be permitted in pipe until a period of at least four hours has elapsed for solvent weld setting or curing, or as required by solvent manufacturer.
   2. Backfilling shall be done when pipe is not in expanded condition due to heat.
      a. Cooling of pipe can be accom plished by operating the system for a short time before backfill, or by backf illing in the early part of the m orning before the heat of the day.
   3. Curing: When the temperature is above 80 degree F., soluble weld joints shall be given at least 24 hours curing tim e before water is introduced under pressure.

D. Automatic Controller:
   1. Install controller in accord with the Drawings and the m anufacturer's instructions, and place readily accessible. Install electrical wiring in accord with applicable code.
   2. Include electrical connection as part of this Section. Contractor to provide 120 volt electrical power to timeclock per local codes.
   3. An operating diagram or schedule clearly indicating the sequence of operation shall be posted in the controller to f acilitate the selection of the valve to be operated and setting of controller.

4. Each controller shall be supplied with a permanent connection for a TRC Commander System. Contractor shall provide TRC Commander.

E. Remote Control Valves:
1. Install at sufficient depth to provide not more than 6" nor less than 4" cover from the top of the valve to finish grade. Provide clearance for PRS-B device as needed.
2. Install valves in a plumb position with 24" minimum clearance from other equipment for proper maintenance.
3. All valves shall be installed in appropriate sized valve boxes with cover.

F. Wire Connections: All underground wire connections to electric remote control valves shall be made by using Snap-Tite connectors as manufactured by Rainbird Sprinkler Corporation.

G. Gate Valves:
1. Line size and install where indicated and sufficient clearance from other materials for proper maintenance.
2. Equip valves, sizes 3" and smaller, with standard hand operating wheel for operation. Valve bonnet packing shall be checked and tightened before backfill. All valves shall be 150 psi rated.
3. All valves shall be installed in appropriate sized valve boxes with cover.
4. Gate Valves shall be manufactured in the USA of American made materials.

H. Sprinkler Heads:
1. Install in a plumb position at intervals not to exceed the maximum spacing indicated.
2. Heads in lawn or turf areas where grass has not been established shall be installed on temporary risers extending at least 2" above grades.
3. Where heads are installed along walks, roads, etc., they shall be permanently positioned.

I. Thrust Blocks: Install thrust blocks on all main irrigation lines 4" or larger at all changes of direction, as detailed in manufacturer's recommendations on pipe installation or as shown on the drawings.

J. Flushing of System:
1. Flush main and lateral systems to clean out all debris and sediment prior to installation of heads.
2. This does not relieve requirements of future adjustments of system or re-flushing system.
3. Any zone requiring repair from broken lateral lines shall be flushed prior to being returned to service.

3.03 ELECTRICAL

A. Connect time clock to the 120 volt power source per manufacturer's recommendations. Be responsible for making electrical connections to the automatic controller and wire circuits from remote control valves to controllers. All wiring shall be in accord with applicable codes.

B. Plan ahead to minimize control wire splices. All wire splices must occur within splice boxes (Ametek 10" round box with green locking lid), using wire connectors as specified in Section 3.02 F above.

C. Provide for an earth ground per manufacturer's recommendations, but not more than 10ohms to ground.

3.04 PRESSURE TEST

A. Test all pressure lines under hydrostatic pressure of 175 lbs. per square inch and all non-pressure lines shall be tested under the existing static pressure and both be proven watertight.

B. Connect a calibrated pressure gauge to mainline. Pressure shall be sustained in the lines for not less than four hours. Should mainline lose pressure, the leak shall be found and repaired, or joints shall be replaced and the test repeated until the entire system is proven watertight.

C. Perform tests prior to backfill.

3.05 LOWERING OF HEADS

A. All sprinklers installed in lawn areas unless otherwise noted shall be lowered to finish grade within ten days following notification by the Owner.

B. At the time of lowering heads, completely check and adjust the entire system and make any repairs that are necessary to complete this work.

3.06 ADJUST AND CLEAN

A. Installations and Operations: Make such adjustments and repairs as requested as necessary for acceptance at no additional cost to the Owner. Field conditions may require minor adjustments to design to achieve 100% coverage.

3.07 COMPLETION AND ACCEPTANCE

A. Completion of work shall mean the full and exact compliance and conformity with provisions expressed or implied in the drawings and specifications.

B. All work under this contract shall not be finally accepted until expiration of the guarantee period.

C. The Irrigation Contractor shall dem onstrate and fully acquaint the Owner and/or Owner's Representative with the entire system , proving that all rem ote control valves are properly balanced, that all heads are properly adjusted for radius and arc of coverage, and that the system is workable, clean, and efficient. This shall be a requirement for acceptance of the work.

D. Contractor shall upon request for final pa yment, give Owner one set of sepias of as-built irrigation system with all valves, tees and heads indicated as installed.

E. Irrigation Contractor shall provide a letter (on his letterhead) to the Owner, stating that there are no outstanding liens agains t the property that m ay have resulted from any aspect of his work. This includes, but is not lim ited to, construction liens, material liens, or labor liens.

3.08 GUARANTEE AND REPLACEMENT

A. The Irrigation Contractor shall f urnish warranties in writing certif ying that the quality and workm anship of all m aterials and installation f urnished is in accordance with these specifications and in accordance with original manufacturer's warranties. Irrigation Contractor shall further see to the fulfillment of all m anufacturers' warranties. Irrigation Contractor shall warrant the installation workmanship for a period of one (1) year from date of completion or acceptance of the job, or any accepted portion of the job.

B. Should the Irrigation Contractor be notified that work or replacem ents are warranted under these conditions, he sha ll provide the required service and/or replacements promptly within two (2) days.

END OF SECTION

SECTION 03100 - CONCRETE FORMWORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work included in this section consists of providing all labor, materials and equipment necessary for providing and installing formwork for concrete.

B. Related Work Described Elsewhere:

1. Section 03200 - Concrete Reinforcement

2. Section 03300 - Cast-in-Place Concrete

C. General Design: The Contractor shall be responsible for the design of all formwork and for safety in its construction, use and removal.

1.02 QUALITY ASSURANCE

A. Qualifications: Formwork shall be constructed in accordance with the specified standards, as well as all pertinent codes and regulations. Where provisions of pertinent codes conflict with the requirements of this section of these specifications, the more stringent provisions shall govern.

B. 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. Local codes and regulations

1.03 SUBMITTALS

A. Materials: Submit manufacturer's literature on form ties, spreaders, corner formers, form coatings and bond breakers.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Form Lumber: Use form lumber when in contact with exposed concrete, conforming to one of the following, a combination thereof, or equivalent as approved by the Engineer.

1. Lumber: Douglas Fir-Larch No. 2 grade, seasoned, surfaced on four sides.

2. Plywood: "Plyform", Class I or II, bearing the label of the Douglas Plywood Association. (Minimum 3/4-inch thickness)

B. Form Ties: Use form ties which do not leave an open hole through the concrete and which permit neat and solid patching at every hole. Use embedded rods with integral waterstops and cones to provide a 1-inch breakback. Wire ties and wood spreaders will not be permitted.

C. Form Coatings: Form release coating shall be a paraffin base oil or mineral oil coating which effectively prevents absorption of moisture, prevents bonding with concrete, is non-staining to concrete and leaves the concrete with a paintable surface.

D. Chamfer Strips: Chamfer strips shall be polyvinyl strips or approved equal, designed to be nailed in the forms to provide a 1-inch chamfer (unless indicated otherwise) at exposed edges of concrete members.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Construction of Formwork: Forms shall be sufficiently strong to withstand the pressure resulting from the placement and vibration of concrete and shall be sufficiently rigid to maintain specified tolerances. Forms shall be sufficiently tight to prevent loss of mortar, and shall be adequately braced against lateral, upward or downward movement.

B. Coating of Forms: Apply form coating to board forms prior to placing reinforcing. Keep form coatings off steel reinforcing, items to be embedded and previously placed concrete.

C. Form Erection:

1. Provide a means of holding adjacent edges and ends of panels and sections tightly together and in accurate alignment so as to prevent the formation of ridges, fins, offsets, or similar surface defects of the finished concrete. Insure that forms may be removed without injury to the surface of the finished concrete.

2. Provide a positive means of adjustment of shores and struts. Insure that all settlement is taken up during concrete placing.

3. Temporary openings shall be provided in wall forms to limit the free fall of concrete to a maximum of 6 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.

4. Do not embed any form-tying device or part thereof other than metal in concrete.

5. Form surfaces of concrete members except where placement of the concrete against the ground is shown on the drawings. The dimensions of concrete members shown on the drawings apply to formed surfaces, except where otherwise indicated.

D. Form Reuse: Reuse only forms which maintain a uniform surface texture on exposed concrete surfaces. Apply light sanding between uses to obtain such a uniform texture. Plug unused tie rod holes with corks, shave flush, and sandpaper on the concrete surface side.

E. Removal of Forms:

1. Forms and shoring for elevated structural slabs, girders, and/or beams shall remain in place until the concrete has reached a compressive strength equal to the specified 28-day compressive strength as determined by test cylinders. Do not remove supports and reshore. The following table indicates the minimum allowable time after the last concrete is placed before forms, shoring, and/or bracing may be removed.

Structural Item	Minimum Allowable Time
Bottom side of slabs, girders, beams	When concrete reaches specified 28-day compressive strength
Vertical sides of girders, beams	48 hours
Walls not supporting vertical or horizontal loads	48 hours
Walls supporting vertical or horizontal	When concrete reaches specified 28-day compressive strength
Footings, pipe encasements, pipe supports	24 hours

2. Do not remove forms from concrete which have been placed with outside air temperature below 50F without first determining if the concrete has properly set without regard for time. Do not apply heavy loading on green concrete. Immediately after forms are removed, the surface of the concrete shall be carefully examined and any irregularities in the surface shall be repaired and finished as specified.

F. Formed Openings: Openings shall be of sufficient size to permit final alignment of the items within it without deflection or offsets of any kind and to allow space for packing where the

items pass through the wall to ensure water tightness around openings so formed. Provide openings with continuous keyways with waterstops where required, and provide a slight flare to facilitate grouting and the escape of entrained air during grouting. Provide formed openings with reinforcement as indicated and specified. Reinforcing steel shall be at least 2 inches clear from the opening.

G. Embedded Items: 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.

H. 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.

I. Form Tolerances:

1. Failure of the forms to produce the specified concrete surface tolerance shall be grounds for rejection of the concrete work. Rejected work shall be repaired or replaced at no cost to the Owner.
2. The following table indicates tolerances or allowable variations from dimensions or positions of structural concrete work:

Maximum Tolerance

Sleeves and Inserts	+1/4" to -1/4"
Projected ends of anchors	+1/4" to -0.0"
Anchor bolt setting	+1/4" to -1/4"
Finished concrete, all locations	+ 1/4" to -1/4" in 10-feet of length

The planes or axes from which the above tolerances are to be measured shall be as follows:

Sleeves and Inserts	Centerline of sleeve or insert
Projected ends of anchors	Plane perpendicular to the end of the anchor as located on the drawings
Anchor bolt setting	Centerline of anchor bolts

Finish concrete	The concrete surface as located on the drawings

3. Where equipment is to be installed, comply with manufacturer's tolerances if more severe than above.

END OF SECTION

SECTION 03200 - CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work included in this Section consists of providing reinforcing steel and welded wire mesh for cast-in-place or precast concrete structures.

B. Related Work:

1. Concrete Formwork: Section 03100

2. Cast-In-Place Concrete: Section 03300

1.02 QUALITY ASSURANCE

A. Standards: Unless otherwise indicated, all materials, workmanship and practices shall meet all requirements of the current editions of the following standards:

1. 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.

1.03 SUBMITTALS

A. Complete shop drawings shall be submitted for approval, including bar lists and placing drawings. 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 Bars: ASTM A615, Grade 60, deformed bars of a USA manufacturer.

B. Welded Wire Fabric: ASTM A185, galvanized.

C. Metal Bar Supports: CRSI MSP-2, Chapter 3, Class 2, Type B, Stainless Steel Protected Bar Supports.

D. Coupler Splice Devices: Cadweld, tension couplers capable of developing the ultimate strength of the bar, as manufactured by Erico Products, Incorporated, Solon, Ohio, or equal and where approved by the Engineer.

2.02 FABRICATION

A. Fabrication shall not begin until the approval of the shop drawings by the Engineer 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 indicated on the Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Supporting Reinforcing: Bar supports shall be provided as required by CRSI MSP-2 and AC1315. 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.

B. 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.

C. Welded Wire Fabric: Splices in welded wire fabric shall be such that the overlap between 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 indicated.

D. Coupler Splice: Unless indicated on the Drawings or where conventional lap splices cannot be achieved, full positive tension connections shall be provided. Such devices shall be installed in accordance with the recommendations of the manufacturer.

E. Dowels: Dowels shall be wired in position prior to placing concrete.

F. Field Bending: Heat shall not be used to bend bars. Bars shall not be bent after being embedded in concrete.

G. Welding: Welding of reinforcing will not be permitted.

H. Place reinforcement a minimum of 2 inches clear of any metal pipe or fittings.

END OF SECTION

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work included in this Section consists of providing cast-in-place concrete.

B. Related Work Described Elsewhere:

1. Concrete Formwork: Section 03100

2. Concrete Reinforcement: Section 03200

1.02 QUALITY ASSURANCE

A. Standards: Unless otherwise indicated, all materials, workmanship and practices shall conform to the requirements of the following standards:

1. Standard Building Code, 2010 Florida Building Code, or latest edition

2. Local Codes and Regulations

3. ACI 318-83, Building Code Requirements for Reinforced Concrete

B. Plant Qualification: Plant equipment and facilities shall meet all requirements of the Check List for Certification of Ready Mixed Concrete Production Facilities of the National ready Mixed Concrete Association and ASTM C 94.

C. Evaluation and Acceptance of Concrete: Evaluation and acceptance of concrete will be in accordance with ACI-318, Chapter 4.

1.03 SUBMITTALS

A. Materials and Shop Drawings: The following information shall be submitted for approval. No concrete shall be furnished until submittal has been approved.

1. Plant Qualification: Satisfactory evidence shall be submitted indicating

2. Materials: Satisfactory evidence shall be submitted indicating that materials to be used, including cement, aggregates and admixtures meet the specified requirements.

3. Design Mix: The design mix to be used shall be prepared by qualified persons and submitted for approval. Submit affidavit as to design mix performance over the preceding six months. The design of the mix is the responsibility of the Contractor subject to the limitations of the Specifications. Approval of this submission will be required only as minimum requirements of the Specifications have been met. Such approval will in no way alter the responsibility of the contractor to furnish concrete meeting the requirements of the Specifications relative to strength and slump.

4. Ready Mix Concrete: Provide delivery tickets or weighmasters certificate per ASTM C 94, including weights of cement and each size aggregate, amount of water in the aggregate, and amount of water added at the plant. Write in the amount of water added on the job. Retain all delivery tickets and turn in to Owner as part of closeout documents.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cement:

1. Cement for all concrete shall be domestic Portland cement that conforms to the requirements of ASTM Designation C 150 Type I, Type II or Type III. All sanitary sewer manholes, wet wells, pumping stations, tanks and structures exposed to wastewater shall be constructed with Type II cement. Type III cement for high early strength concrete shall be used only for special locations and only with the approval of the Engineer. Type I cement may be used for buildings and tremie concrete.

2. Only one brand of cement shall be used in any individual structure unless approved by the Engineer. Cement which has become damaged, partially set, lumpy or caked shall not be used and the entire contents of the sack or container which contains such cement will be rejected. No salvaged or reclaimed cement shall be used.

3. Fly Ash shall not be used in either Class A or Class B concrete.

B. Aggregates:

1. ASTM C 33. Coarse aggregates shall be size No. 57. Block cell fill shall be size No. 89.

2. In addition to requirements of ASTM C 33 for structures exposed to wastewater, the following shall apply:

a. Soft particles: 2.0 percent
b. Chert as a soft impurity (defined in Table 3 of ASTM C 33): 1.0 percent
c. Total of soft particles and chert as a soft impurity: 2.0 percent
d. Flat and elongated particles (long dimension more than 5 times short dimension): 15.0 percent

C. Water: Clean and free from injurious amounts of deleterious materials.

D. Air Entraining Admixture: ASTM C 260.

E. Water Reducing and Retarding Admixture: ASTM C 494, Type D. Admixture shall not contain calcium chloride.

F. Epoxy Bonding Agent: Sikastix 370, Sikadur Hi Mod, Concresive 1001-LPL or approved equal.

2.02 MIXES

A. General Requirements:

1. Mix Design: Proportioning shall be on the basis of field experience and/or trial mixtures as specified in ACI 318, Section 4.3. Data on consecutive compression tests and standard deviation shall be submitted. Proportioning for small structures may be by the water/cement ratio under special approval by the Engineer. Concrete mix design shall comply with the Standard Building Code requirements.

2. Air Content: 5 percent plus or minus 1 percent (Class A and B).

3. Slump: 4 inches plus or minus 1 inch.
8 inches plus or minus 1 inch for tremie concrete.

4. Water cement ratio = 0.45 maximum (all concrete exposed to hydrostatic loading), 0.50 maximum (all other concrete).

5. Minimum Compressive Strength at 28 days:

a. Class A, 4,000 psi Wastewater structures inclusive of tanks, ditches, pumping stations, tremie concrete and other structures in contact with treated waters.

b. Class B, 3,000 psi Building structures, encasements, thrust blocks, and pipe supports, etc. not in contact with treated waters.

B. Production of Concrete:

1. General: Concrete shall be ready mixed and shall be batched, mixed and transported in accordance with ASTM C 94, except as otherwise indicated.

2. Air Entraining Admixture: Air entraining admixture shall be charged into the mixture as a solution and shall be measured by means of an approved mechanical dispensing device. The liquid shall be considered a part of the mixing water.

3. Water Reducing and Retarding Admixture: Water reducing and retarding admixture shall be added and measured as recommended by the manufacturer. The addition of the admixture shall be separate from the air entraining admixture. The addition of the admixture shall be completed within one minute after addition of water to the cement has been completed, or prior to the beginning of the last three-quarters of the required mixing, whichever occurs first. Admixtures shall be stored, handled and batched in accordance with the recommendations of ACI 68.

C. Delivery Tickets: In addition to the information required by ASTM C 94, delivery tickets shall indicate the cement content and the water/cement ratio.

D. Temperatures: The temperature of the concrete upon delivery from the truck shall not exceed 90?F.

E. Modifications To The Mix: No modifications to the mix shall be made in the plant or on the job which will decrease the cement content or increase the water-cement ratio beyond that specified. No modifications of any kind shall be made except by a qualified and responsible representative of the concrete producer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Preparations Before Placing: No concrete shall be placed until the approval of the Engineer has been received. Approval will not be granted until forms are thoroughly clean, and reinforcing and all other items required to be set in concrete have been placed and thoroughly secured. The Engineer shall be notified a minimum of 24 hours before concrete is placed.

B. Conveying:

1. General: Concrete shall be handled from the truck to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients to maintain the

quality of the concrete. No concrete shall be placed more than 90 minutes after mixing has begun for that particular batch.

2. Buckets and Hoppers: Buckets and hoppers shall have discharge gates with a clear opening equal to no less than one-third of the maximum interior horizontal area, or five times the maximum aggregate size being used. Side slopes shall be no less than 60 degrees. Controls on gates shall permit opening and closing during the discharge cycle.

3. Runways: Extreme care shall be exercised to avoid displacement of reinforcing during the placing of concrete.

4. Elephant Trunks: Hoppers and elephant trunks shall be used to prevent the free fall of concrete for more than 6 feet.

5. Chutes: Chutes shall be metal or metal lined, and shall have a slope not exceeding one vertical to two horizontal, and not less than one vertical to three horizontal. Chutes more than 20 feet long and chutes not meeting the slope requirements, may be used only if they discharge into a hopper before distribution.

6. Pumping Equipment: Pumping equipment and procedures, if used, shall conform to the recommendations contained in the report of ACI Committee 304 on "Placing Concrete by Pumping Methods," ACI 304.2R-71. The specified slump shall be measured at the point of discharge. The loss of slump in pumping shall not exceed 1-1/2 inches.

7. Conveying equipment Construction: Aluminum or aluminum alloy pipe for tremies or pump lines and chutes, except for short lengths at the truck mixer shall not be permitted.

8. Cleaning: Conveying equipment shall be cleaned at the end of each concrete operation.

3.02 APPLICATION

A. Placing:

1. General: Concrete shall be deposited continuously, or in layers of such thickness (not exceeding 2 feet in depth) that no concrete will be deposited on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness.

2. Supported Elements: At least two hours shall elapse after depositing concrete in columns or walls before depositing in beams, girders, or slabs supported thereon.

3. Segregation: Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Concrete shall not be subjected to procedures which will cause segregation.

4. Concrete Under Water: All concrete, except that indicated on the Drawings as Tremie concrete, shall be placed in the dry.

B. Seals and Tremie Concrete:

1. General:

a. Wherever practicable, all foundation excavations shall be dewatered and the concrete deposited in the dry. Where conditions are encountered which render it impracticable to dewater the foundation before placing concrete, a concrete foundation seal shall be placed. The foundation shall then be dewatered, and the balance of the concrete placed in the dry.
b. When seal concrete is required to be placed, the satisfactory performance of the seal in providing a watertight excavation for placing structural concrete shall be the responsibility of the Contractor. Seal concrete placed by the Contractor, which subsequently fails to perform properly, shall be repaired as necessary to perform its required function, at the expense of the Contractor.

2. Method of Placing: Concrete deposited under water shall be carefully placed in the space in which it is to remain by means of a tremie, a closed-bottom dump bucket of not less than one cubic yard capacity, or other approved method, and shall not be disturbed after it is deposited. All seal concrete shall be deposited in one continuous pour. No concrete shall be placed in running water. All form work designed to retain concrete under water shall be watertight, and the design of the form work and excavation sheeting shall be by a Professional Engineer, registered in the State of Florida.

3. Use of Tremie: The tremie shall consist of a tube having a minimum inside diameter of ten inches, and shall be constructed in sections having tight joints. No aluminum parts which have contact with the concrete will be permitted. The discharge end shall be entirely seated at all times, and the tremie tube kept full to the bottom of the hopper. When a batch is dumped into the hopper, the tremie shall be slightly raised (but not out of the concrete at the bottom) until the batch discharges to the bottom of the hopper, after which the flow shall be stopped by lowering the tremie. The means of supporting the tremie shall be such as to permit the free movement of the discharge end over the entire top surface of the work, and shall permit it being lowered rapidly when necessary to choke off or retard the flow. The flow shall preferably be continuous, and in no case shall be interrupted until the work is completed. Special care shall be exercised to maintain still water at the point of deposit.

4. Use of Bottom-dump Bucket: When the concrete is placed by means of a bottom-dump bucket, the bucket shall be lowered gradually and carefully until it rests upon the concrete already placed. The bucket shall then be raised very slowly during the discharge travel; the intent being to maintain, as nearly as possible, still water at the point of discharge and to avoid agitating the mixture. Aluminum buckets will not be permitted.

5. Time of Beginning Pumping: Pumping to dewater a sealed cofferdam shall not commence until the seal has set sufficiently to withstand the hydrostatic pressure, and in no case earlier than 72 hours after placement of the concrete.

C. Consolidating Concrete:

1. General: Concrete shall be consolidated by means of internal vibrators operated by competent workmen.

2. Vibrators: Vibrators shall have a minimum head diameter of at least 2 inches, a minimum centrifugal force of 700 pounds and a minimum frequency of 8,000 vibrators per second.

3. Vibrators for Confined Areas: In confined areas, the specified vibrators shall be supplemented by others having a minimum head diameter of 1-1/2 inches, a minimum centrifugal force of 300 pounds and a minimum frequency of 9,000 vibrations per second.

4. Spare Vibrator: One spare vibrator for each three in use shall be kept on the site during all concrete placing operations.

5. Use of Vibrators: Vibrators shall be inserted and withdrawn at points approximately 18 inches apart. The duration of each insertion shall be from 5 to 15 seconds. Concrete shall not be transported in the forms by means of vibrators.

D. Protection: Rainwater shall not be allowed to increase the mixing water, nor to damage the surface finish. Concrete shall be protected from construction overloads. Design loads shall not be applied until the specified strength has been attained.

3.03 CONCRETE FINISHING AND CURING

A. All slabs exposed to view shall receive a steel trowel finish without local depressions or high points and apply a light hair-broom finish. Do not use stiff bristle brooms or brushes. Leave hair-broom lines parallel to the direction of slab drainage.

B. All other slabs and footings shall receive a smooth steel trowel finish.

C. All walls of structures or parts of buildings exposed to view shall receive the following finish. Repair defective concrete, remove fins, fill depressions 1/4-inch or deeper, and fill tie holes. In addition, any surface not receiving a special applied finish, shall receive a slurry finish consisting of one part cement and one and one-half parts sand by damp loose volume. Dampen surfaces and then apply the slurry with clean burlap pads or sponge rubber floats. Remove any surplus by scraping and then rubbing with clean burlap. Surfaces which will receive a special applied finish shall be of even color, have no pits, pockets, holes, or sharp changes of surface elevation. Scrubbing with a stiff bristle fiber brush shall produce no dusting or dislodging of cement or sand.

D. All concrete shall be wet cured a minimum of 7 days; or if not to receive special finishes, coatings or concrete toppings, an Engineer approved curing compound may be utilized.

E. All surface defects shall be repaired by removing defective concrete down to sound concrete and repairing with patching mortar. Finished repair shall match adjacent concrete and be cured as specified.

3.04 TESTING

A. A testing laboratory approved by the Owner will make such tests as are deemed advisable. The Contractor shall pay for all tests indicating a failure to comply with the Specifications. The Contractor shall keep the laboratory informed of his schedule.

B. Standard laboratory compressive test cylinders will be obtained by the laboratory when concrete is discharged at the point of placing (i.e., discharge end of pumping equipment), and cylinders will be made and cured in accordance with the requirements of ASTM Designation C 31. A set of 4 cylinders will be obtained for each 50 cubic yards or fraction thereof placed each day, for each type of concrete. The cylinders will be cured under laboratory conditions and will be tested at 7 and 28 days of age, respectively, in accordance with the requirements of ASTM Designation C 39.

C. The testing laboratory will make slump tests of Class A and Class B concrete as it is discharged from the mixer at the point of placing. Slump tests will be made for each 25 cubic yards or "pour" of concrete placed. Slump tests may be made on any batch, and failure to meet specified slump requirements will be sufficient cause for rejection of that batch.

END OF SECTION

SECTION 16010 - GENERAL PROVISIONS

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. The work covered under this Division of the Specifications is intended to include the furnishing of all materials, equipment and labor necessary for or reasonably incidental to, the installation of a complete and fully operative electrical system as indicated on the drawings and specified in this section.

1. The work shall consist generally of, but is not limited to, the following major items:

a. Main Distribution Boards.
b. Conduit and Wiring.
c. Panelboards.
d. Temporary lighting and power.
e. Lighting fixtures complete with lamps.
f. Telephone conduit system.
g. Fire Alarm System.
h. Lighting Control.

B. Work Not Included:

The following work is not included in this Section:

1. Temperature controls and related wiring.

C. Fees and Permits:

1. Obtain all permits required for his/her work and include the cost of same in his/her bid.
2. The contractor shall also include in his/her bid the cost for the power company service.

D. Certificate of Inspection:

The Contractor shall, at his/her expense, have a final inspection made of the complete electrical installation and shall deliver a certificate of approval of the complete work to the Owner before receiving his/her final payment.

1.02 SUBMITTALS

A. Shop Drawings:

1. Submit copies of manufacturer's drawing of safety switches, conduit, wire, wiring devices, and any other special electrical equipment to be installed, and shall receive the Project Architect's acceptance before ordering the same for installation.

2. All shop drawings shall be submitted in 3-ring binders with each specification section indicated with tabs.

3. If shop drawings are submitted intermittingly and not in 3-ring binders, they will not be reviewed and will be returned to contractor for proper submittal.

4. Accepted Equivalent:

Any manufacturer and/or catalog number listed on the drawings or in the Project Manual shall be construed to mean "or accepted equivalent".

a. Any substitutions to be consideredas "Accepted Equivalent" shall be submitted with both the cut of the proposed substitution and a cut of the specified equipment to the Project Architect in writing, and returned to the Contractor at least ten days prior to bid opening.

b. No substitutions shall be submitted or will be allowed after the contract has been awarded.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturers, materials and equipment:

1. Material and equipment, except as herein otherwise noted, shall be new and conform to standards specified herein defined to include conduits, cable, wiring materials and devices, panelboards, and the like.

2. Materials and equipment shall be of an approved design.

a. Similar materials shall be of one manufacturer wherever possible.

3. Equipment offered under these Specifications shall be limited to products regularly produced and recommended for service ratings in accordance with manufacturer's catalogs, engineering data, or other comprehensive literature

made available to the public and in effect at the time of opening of bids.

4. Install equipment in strict accordance with manufacturer's instruction for type, capacity and suitability of each piece of equipment used.

a. Obtain these instructions which shall be considered a part of these Specifications.

B. Qualifications of supervisor, workmanship and installers:

1. The Contractor shall have a Master Electrician constantly supervising the work covered by these Specifications, and so far as possible shall keep the same foreman on the job from start to finish.

a. The workmanship of the entire job shall be first class in every way and only experienced and competent workers shall be employed for the work.

1.04 CODES AND REGULATIONS

A. Work shall be installed in accordance with the regulations and requirements of the National Electrical Code NFPA No. 70; Life Safety Code NFPA No. 101, Standard Building Code as well as all rules, state and local codes regulations and requirements of the telephone and power companies.

B. Where conduits and/or cables penetrate fire rated walls, ceilings or floors, the penetrations shall be firestopped in accordance with chapter 10, section 1001 of the standard building code.

1. The above shall be ascertained and fully coordinated before the installation of any material, equipment, and the like, and any discrepancy shall be immediately brought to the attention of the Project Architect in writing, and the Contractor shall receive a disposition of same before proceeding with the work.

2. Furnish, without additional charge, any additional materials and labor that may be required for compliance with these codes, law, rules, regulations or requirements even though the work is not mentioned in these Specifications or shown on the Drawings.

C. Material and equipment shall bear the label of approval of the National Board of Fire Underwriters Laboratory.

1.05 INSPECTIONS

A. All work and materials covered by these Specifications and shown on the Drawings

shall be subject to inspection at any and all times by representatives of the Project Architect or Owner.

B. If the Project Architect or Owner's inspectors find that any material does not conform with these Specifications, the Contractor shall within three days after being notified by the Project Architect or Owner, remove the material from the premises, and if said material has been installed, the entire expense of removing and replacing same, including any cutting and patching that may be necessary, shall be borne by the Contractor.

C. Tests:

The Owner reserves the right to inspect and test any portion of the equipment during the progress of this work.

1. The Contractor shall test the entire system in the presence of the Owner or the Owner's representative when the work is completed to insure that all portions are free from short circuits and grounds.

2. All equipment, material and labor necessary to conduct the above tests shall be furnished at the Electrical Contractor’s expense.

1.06 PRODUCT HANDLING

A. Protection of Equipment, Material and Work: The Contractor shall effectively protect, at his/her own expense, much of his/her work, materials or equipment, as is liable to injury during the construction period.

1. Openings into any part of the conduit system as well as associated fixtures, equipment, and the like, both before and after being set in place, shall be securely covered or otherwise protected to prevent obstruction of the conduit, or injury due to carelessness or maliciously dropped tools or materials, grit, dirt, or any foreign matter.

a. The Contractor will be held responsible for all damage done until his/her work is fully and finally accepted.

2. Cover conduit ends with capped bushings.

B. Repair of damage: In the event of damage, repair shall be made immediately, to the Project Architect's satisfaction and at no additional cost to the Owner.

1.07 JOB CONDITIONS

A. Accuracy of Data: The data given hereinand on the Drawings are as exact as could be secured.

1. The Specifications and Drawings are for the assistance and guidance of the Contractor.

2. Exact locations, distances, levels, and the like, will be governed by the building field conditions and the Contractor shall use the data contained herein with this understanding.

B. Drawings:

1. The electrical drawings are diagrammatic, but shall be followed as closely as actual construction and work of other Contractors will permit.

2. Deviations from drawings required to make the work of the Contractor conform to the building as constructed, and to the work of other contractors, shall be made by the Contractor at his/her expense.

3. The branch circuit wiring and arrangements of home runs have been worked out for maximum economy consistent with adequate sizing for voltage drop, and the like. Maximum number of branch circuits per home-run conduit shall be (3) three.

4. Install the wiring circuits arranged exactly as shown on the drawings.

5. It is not the intention of the drawings or specifications to indicate each piece of conduit, fittings, and the like, required for the satisfactory operation of the installation and whereby one is indicated, but not specified, or specified but not indicated on the drawings, it shall be considered to be both specified and indicated.

C. Measurements:

1. Review the Contract Drawings and Specifications and visit the job site to ascertain all conditions, including conduit runs, interfacing, interferences, conflicts, discrepancies, etc., and shall report the same to the Engineer for clarification ten days prior to submittal of the bid.

2. Failure to comply with this condition shall constitute an acceptance of the conditions and any necessary changes will be at Contractor's expense.

3. The Contractor shall make all measurements necessary for his/her work and shall assume responsibility for their accuracy.

4. Install necessary pull boxes, manholes and junction boxes as may be required to accomplish the distribution system indicated on the riser diagram.

D. Cooperation with Other Contractors

1. The Contractor shall arrange all parts of his/her work in proper relation to the work of other contractors.

2. Where interferences occur, the Contractor shall, before installing the work involved, consult with the Project Architect as to exact location and level of his/her work.

3. The Project Architect's decision will be final.

4. The Contractor shall be responsible for arrangement of his/her work and equipment and maintenance of proper headroom under this work.

5. Should work installed by him/her require any modifications to avoid interference with the other work, such changes shall be made without additional cost.

6. The Architect's decision as to determination or allocation or responsibility where conditions require changing of work, shall be final.

7. If any work of the Contractor is dependent for its proper execution on contiguous work, examine such work and report in writing any defect thereon or conditions rendering it unsuitable.

8. The beginning of work, without making such report, shall constitute an acceptance of such work, and any defects in his/her own work consequently shall be his/her responsibility.

1.08 TEMPORARY SERVICE (NOT REQUIRED FOR THIS PROJECT)

A. Temporary power: Provide, maintain and remove after construction is completed, a temporary lighting, receptacle and power system in accordance with the progress schedule.

1. Lighting: An average of one hundred watt bulb every 200 square feet and a duplex receptacle every 500 square feet.

2. Receptacles: Ground fault interrupter type.

3. Three Phase Power for Testing Motors: Provided at all necessary points.

B. Temporary telephone service: Each respective trade shall be responsible for providing and maintaining their telephone services.

1.09 CLEANING

A. Keep the premises free of debris and unusable materials resulting from the work, and immediately upon completion of the work remove such debris and material from the site and leave floors broom clean in areas affected by the work.

1.10 GUARANTEE

A. Leave the electrical installation in proper working order and without charge, replace any work or materials which develop defects within one year from date of final inspection and acceptance by the Owner.

1.11 DEFINITIONS

A. In this Division "provide" is used as a term contraction meaning "to furnish, install and connect up completely in the specified or in an approved manner for the item and/or material described".

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

SECTION 16110 - RACEWAYS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

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

B. This section is a Division 16 Basic Electrical Materials and Methods section, and is part of each Division 16 section making reference to electrical raceways specified herein.

1.02 DESCRIPTION OF WORK:

A. Extent of raceway work is indicated by drawings and schedules.

B. Types of raceway specified in this section include the following:

1. Liquid tight flexible metal conduit.
2. Electrical metallic tubing (EMT).
3. Rigid nonmetallic conduit (PVC).

C. Electrical nonmetallic tubing (ENT) is not acceptable.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of raceway systems of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Installer shall have at least 3 years of successful installation experience on projects with electrical raceway work similar to that required for this project.

1.04 CODES AND STANDARDS:

A. NEMA Compliance: Comply with applicable requirements of NEMA Standards Publications pertaining to raceways.

B. UL Compliance and Labeling: Comply with applicable requirements of UL safety standards pertaining to electrical raceway systems. Provide raceway products and components which have been UL listed and labeled.

C. NEC Compliance: Comply with applicable requirements of NFPA-70 pertaining to construction and installation of raceway systems.

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data, including specifications and installation instructions for each type of raceway system required. Include data substantiating that materials comply with requirements.

PART 2 - PRODUCTS

2.01 GENERAL:

A. Provide raceways and fittings, of types, sizes, and weights (wall thickness) for each installation indicated. Where types are not indicated, provide proper selection determined by installer to fulfill installation requirements and comply with applicable portions of NFPA-70 for raceways.

B. All conduits and fittings shall bear the U.L. label or seal.

C. Minimum trade size raceway shall be 1/2".

D. Where conduit size is not indicated on plan, size conduit in accordance with NFPA-70, except no conduit smaller than 3/4" shall be embedded in concrete or masonry or installed below grade.

2.02 LIQUID TIGHT FLEXIBLE METAL CONDUIT

A. Provide liquid tight flexible metal conduit constructed from a continuous, flexible, interlocked, single strip and double wrapped steel, galvanized inside and outside, coated with liquid tight jacket of flexible polyvinyl chloride (PVC), and conforming to U.L. 360.

B. Provide compression type cadmium plated, malleable iron fittings with neoprene gasket sealing rings, and complying with ANSI/NEMA FB1 and U.L. 5148.

C. Provide insulated throat connectors for terminations.

2.03 ELECTRICAL METALLIC TUBING

A. Provide galvanized steel tubing conforming to Federal Specification WW-C-563, ANSI C80.3, and U.L. 797.

B. Provide set screw or compression type zinc plated or hot-dipped galvanized, malleable iron or steel fittings conforming to Federal Specification W-F-408.

1. Use Type 1 fittings for raintight connections.
2. Use Type 2 fittings for concrete tight connections.

3. Use Type 3 fittings for miscellaneous connections.

C. Provide insulated throat connectors for terminations.

D. Provide zinc plated or hot-dipped galvanized, malleable iron conduit bodies with removable cover, corrosion resistant screws, threaded hubs and complying with ANSI/NEMA FB1.

2.04 RIGID NONMETALLIC CONDUIT:

A. Provide rigid nonmetallic conduit conforming to Federal Specification WC1094A, NEMA TC-2 and U.L. 651.

1. Heavy Wall Conduit: Schedule 40, 90C, UL. rated, constructed of polyvinyl chloride, for direct burial or normal above ground use.
2. Extra Heavy Wall Conduit: Schedule 80, U.L. rated, constructed of polyvinyl chloride, for direct burial or above ground use.

B. Provide fittings which mate and match to conduit type and material and comply with NEMA TC-3 and U.L. 514.

C. Provide threaded terminal adapters on all rigid nonmetallic conduits terminating in panels, boxes, wire gutters, or cabinets. Adapters to have male threads on one end, socket end on other.

D. Provide zinc plated or hot-dipped galvanized, malleable iron conduit bodies with removable cover, corrosion resistant screws, threaded hubs and complying with ANSI/NEMA FB1.

2.05 EXPANSION FITTINGS:

A. Expansion fittings shall be:

1. U.L. Listed, hot-dipped galvanized inside and outside, providing a 4" expansion chamber, external braided grounding and bonding jumper with approved clamps and U.L. listed for the application.
2. U.L. Listed, polyvinyl chloride, providing a 6" expansion chamber, and meet requirements for rigid nonmetallic conduit.

2.06 Available Conduit Bodies Manufacturers: Subject to compliance with requirements, manufacturers offering conduit bodies which may be incorporated in the work include, but are not limited to the following:

A. Appleton Electric; Div. of Emerson Electric Co.

B. Arrow Hart Div.; Crouse Hinds Co.

C. Bell Electric Div.; Square D Co.

D. Killark Electric Mfg. Co.

E. O-Z/Gedney Div.; General Signal Co.

F. Spring City Electrical Mfg. Co.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. General: Install raceways as indicated; in accordance with manufacturer's written installation instructions, and in compliance with NFPA-70, and NECA's "Standards of Installation".

B. Coordinate with other work including wires/cables, boxes and panel work, as necessary to interface installation of electrical raceways and components with other work.

C. Install conduits concealed in either wall, slabs, or above hung ceilings. Where conduits cannot be concealed, route conduits exposed on wall or ceiling.

D. Mechanically fasten together metal conduits, enclosures and raceways for conductors to form continuous electrical conductor. Connect to electrical boxes, fittings and cabinets to provide electrical continuity and firm mechanical assembly.

E. Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat surfaces with corrosion inhibiting compound before assembling.

F. Install miscellaneous fittings such as reducers, chase nipples, 3 piece unions, split couplings, and plugs that have been specifically designed and manufactured for their particular application. Install expansionfittings in raceways every 200' linear run or wherever structural expansion joints are crossed.

G. Use roughing-in dimensions of electrically operated unit furnished by supplier. Set conduit and boxes for connection to units onlyafter receiving review of dimensions and after checking location with other trades.

H. Provide nylon pull cord in all empty conduits. Test conduits required to be installed, but left empty, test with ball mandrel. Clear any conduit which rejects ball mandrel. Pay costs involved for restoration of conduit and surrounding surfaces to original condition.

3.02 CONDUIT INSTALLATION:

A. Use electrical metal tubing conduit in mechanical equipment rooms, electrical equipment rooms and for main feeder circuits.

B. Use liquid tight flexible metal conduit where subject to one or more of the following conditions:

1. Exterior location.
2. Moist or humid atmosphere where condensate can be expected to accumulate.
3. Corrosive atmosphere.
4. Subjected to water spray or dripping oil, water or grease.

C. Cut conduits straight, properly ream, and cut threads for heavy wall conduit deep and clean.

D. Field bend conduit with benders designed for purpose so as not to distort nor vary internal diameter.

E. Size conduits to meet NFPA-70, except no conduit smaller than 3/4" shall be embedded in concrete or masonry or install below grade.

F. Where penetrating grade or floor in an exposed location from underground or in slab, a black mastic coated or PVC coated galvanized rigid steel conduit shall be used.

G. Provide rigid 90 degree elbows when turning conduit up in slab or turning conduit up above grade.

H. Fasten conduit terminations in sheet metal enclosures by 2 metal locknuts, and terminate with bushing. Install locknuts inside and outside enclosure.

J. Use of running threads at conduit joints and terminations is prohibited. Where required, use 3 piece union or split coupling.

K. Complete installation of electrical raceways before starting installation of cables/wires within raceway.

3.03 CONCEALED CONDUITS:

A. Raceways installed underground or in floors, or outside shall be PVC Schedule 40.

B. Install underground conduits minimum of 24" below finished grade.

3.04 NON-METALLIC CONDUITS:

A. Make solvent cemented joints in accordance with recommendations of manufacturer.

B. Install PVC conduits in accordance with NFPA-70 and in compliance with local utility practices.

3.05 CONDUIT FITTINGS:

A. Construct locknuts for securing conduit to metal enclosure with sharp edge for digging into metal, and ridged outside circumference for proper fastening.

B. Insulated bushing for terminating conduits smaller than 1-1/4" are to have flared bottom and ribbed sides, with smooth upper edges to prevent injury to cable insulation.

C. Insulated bushings for terminating conduits 1-1/4" and larger are to have flared bottom and ribbed sides. Upper edge to have phenolic insulating ring molded into bushing.

D. Bushing off or insulated type to have screw type grounding terminal.

E. Miscellaneous fittings such as reducers, chase nipples, 3 piece unions, split couplings, and plugs to be specifically designed for their particular application.

END OF SECTION

SECTION 16120 - WIRES AND CABLES

PART 1 - GENERAL:

1.01 RELATED DOCUMENTS:

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

B. This section is a Division 16 Basic Electrical Materials and Methods section and is part of Division 16 section making reference to electrical wires and cables specified herein.

1.02 DESCRIPTION OF WORK:

A. Extent of electrical wires and cable work is indicated by drawings and schedules.

B. Types of electrical wire, cable, and connectors specified in this section include the following:

1. Copper conductors.
2. Service entrance cable.
3. Split-bolt connectors.
4. Wirenut connectors.

C. Applications of electrical wire, cable, and connectors required for project are as follows:

1. For power distribution circuits.
2. For motor branch circuits.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in the manufacture of electrical wire and cable products of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience with projects similar to that required for this project.

C. NFPA-70 Compliance: Comply with NFPA-70 requirements as applicable to construction, installation and color-coding of electrical wires and cables.

D. UL Compliance: Comply with applicable requirements of UL Std. 83, "Thermoplastic Insulated Wires and Cables" and Std. 486A, "Wire Connectors and

Soldering for Use With Copper Conductors".

E. UL Compliance: Provide wiring/cabling and connector products which are UL listed and labeled.

F. NEMA/ICEA Compliance: Comply with NEMA/ICEA Std. Pub/No's WC5, Thermoplastic Insulated Wires and Cable for the "Transmission and Distribution of Electrical Energy", and WC30, "Color Coding of Wires and Cables", pertaining to electrical power type wires and cables.

G. IEEE Compliance: Comply with applicable requirements of IEEE Stds. 82, "Test Procedures for Impulse Voltage Tests on Insulated Conductors", and Std. 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to wiring.

H. ASTM Compliance: Comply with applicable requirements of ASTM B1, 2, 3, 8, and D-573. Provide copper conductors with conductivity of not less than 98% at 20 degrees C. (68 deg. F.).

I. FOIST Compliance: Comply with Federal Specifications J-C-30, "Electrical Cable and Wire (Power, Fixed, Installation)", and W-S-610, "Splice Conductor".

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's data on electrical wires, cables, and conductors.

B. DELIVERY, STORAGE, AND HANDLING:

1. Deliver wire and cable properly packaged in factory fabricated type containers, or wound on NEMA specified type wire and cable reels.
2. Store wire and cable in clean dry space in original containers. Protect products from weather, damaging fumes, construction debris and traffic.
3. Handle wire and cable carefully to avoid abrasing, puncturing, and tearing wire and cable insulation and sheathing. Ensure that dielectric resistance integrity of wires/cables is maintained.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. 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:

1. Wire and Cable:

a. Apex Wire and Cable Corp.
b. American Insulated Wire Corp.
c. American Wire and Cable Co.
d. Anaconda-Ericson Inc., Wire and Cable Div.
e. Beldon Div.; Cooper Industries.
f. Brand-Rex Div.; Pyle National Co.
g. Cerro Wire and Cable Corp.
h. Cleveland Insulated Wire Co.
j. Phelps Dodge Cable and Wire Co.
k. Rome Cable Corp.
l. Southwire Corp.
m. Triangle PWC, Inc.

2. Connectors;

a. AMP, Inc.
b. Appleton Electric Co.; Emerson Electric Co.
c. Burndy Corporation.
d. Brand-Rex Div.; Pyle National Co.
e. Electrical Products Div.; Midland Ross Corp.
f. General Electric Co.
g. Ideal Industries, Inc.
h. Leviton Mfg. Company.
i. 3M Company.
j. O-Z/Gedney Co.
k. Southport Industries Inc.
l. Square D Company.
m. Thomas and Betts Corp.

2.02 WIRES, CABLES, AND CONNECTORS:

A. General: Provide electrical wires, cables, and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer, for a complete installation, and for application indicated. Except as otherwise indicated, provide copper conductors with conductivity of not less than 98% at 20 degrees C (68 degrees F.).

B. Building Materials: Provide factory-fabricated wires of sizes, ampacity ratings, and materials for applications and services indicated. Where not indicated, provide proper wire selection as determined by installer to comply with project's installation requirements, NFPA-70 and NEMA standards. Select from the following UL types, those wires with construction features which fulfill project requirements.

1. Type THWN: For dry or wet locations; max. operating temperature 75 deg. C. (167 deg. F.). Insulation, flame retardant, moisture and heat resistant, thermoplastic; outer covering, nylon jacket; conductor, annealed copper.
2. Type THHN: For dry and damp locations; max. operating temperature 90 deg. C. (194 deg. F.). Insulation, flame retardant, heat resistant thermoplastic conductor, annealed copper.

2.03 CONNECTORS:

A. General: Provide Ul type factory fabricated, metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated. Where not indicated, provide proper selection as determined by Installer to comply with project's installation requirements, NFPA-70 and NEMA standards. Select from the following, those types, classes, kinds and styles of connectors to fulfill project requirements:

1. Type: Pressure.
2. Type: Crimp.
3. Type: Threaded.
4. Class: Insulated.
5. Kind: Copper (for CU to CU connection).
6. Style: Butt connection.
7. Style: Elbow connection.
8. Style: Combined "T" and straight connection.
9. Style: "T" connection.
10. Style: Split-bolt parallel connection.
11. Style: Tap connection.
12. Style: Pigtail connection.
13. Style: Wirenut connection.

PART 3 - EXECUTION

3.01 INSTALLATION OF WIRES AND CABLES:

A. General: Install electrical cables, wire and wiring connectors as indicated, in compliance with applicable requirements of NFPA-70, NEMA, UL, and NECA's "Standard of Installation" and in accordance with recognized industry practices.

B. Coordinate wire/cable installation work including electrical raceway and equipment installation work, as necessary to properly interface installation of wires/cables with other work.

C. Install UL type wiring in conduit, for feeders and branch circuits.

D. Pull conductors simultaneously where more than one is being installed in same

raceway.

E. Use pulling compound or lubricant, where necessary; compound used must not deteriorate conductor or insulator.

F. Use pulling means including, fish tape, cable, rope and basket weave wire/cable grips which will not damage cables or raceways.

G. Keep conductor splices to a minimum.

H. Install splices and tapes which possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.

I. Use splice and tap connectors which are compatible with conductor material.

J. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Std 486A and B.

3.02 FIELD QUALITY CONTROL:

A. Prior to energization of circuitry, check installed wires and cables with megohm meter to determine insulation resistance levels to ensure requirements are fulfilled.

B. Prior to energization, test wires and cables for electrical continuity and for short circuits.

C. Subsequent to wire and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.

END OF SECTION

SECTION 16135 - ELECTRICAL BOXES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

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

B. This section is a Division 16 Basic Electrical Materials and Methods section, and is a part of each Division 16 m aking reference to electrical wiring boxes specified herein.

1.02 DESCRIPTION OF WORK:

A. Extent of electrical box work is indicated by drawings and schedules.

B. Types of electrical boxes specified in this section include the following:

1. Outlet boxes.
2. Junction boxes.
3. Pull boxes.
4. In-ground hand hole.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of electrical boxes, of types, sizes, and capacities required, whoseproducts have been in satisfactory use in similar service for not less than 3 years.

B. Installer's Qualifications: Firms with at least 3 years of successful installation experience on projects utilizing electrical boxes similar to those required for this project.

C. NFPA-70 Compliance: Comply with NFPA-70 as applicable to construction and installation of electrical wiring boxes.

D. UL Compliance: Comply with applicable requirements of UL 50, UL 514 Series, and UL 886 pertaining to electrical boxes which are UL listed and labeled.

E. NEMA Compliance: Comply with applicable requirements of NEMA Std. Pub. No.'s OS1, OS2, and Pub.250 pertaining to ou tlets and device boxes, covers and

box supports.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's data on electrical boxes and fittings.

PART 2 - PRODUCTS

2.01 FABRICATED MATERIALS:

A. Outlet Boxes: Provide galvanized coated flat rolled sheet steel outlet wiring boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct outlet boxes with mounting holes, and with cable and conduit size knockout openings in bottom and sides. Provide boxes with threaded screw holes, with corrosion resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding.

1. Outlet Box Accessories: Provide outlet box accessories as required for each installation, including box supports, mounting ears and brackets, wallboard hangers, box extension rings, fixture studs, cable clamps, and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used to fulfill installation requirements for individual wiring situations. Choice of accessories is Installer's code compliance option.

B. Device Boxes: Provide galvanized coated flat rolled sheet steel gangable or non-gangable device boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct device boxes for flush mounting with mounting holes, and with cable size knockout openings in bottom and ends, and with threaded screw holes in end plates for fastening devices. Provide cable clamps, and for equipment type grounding.

1. Device Box Accessories: Provide device box accessories as required for each installation, including mounting brackets, device box extensions, switch box supports, plaster ears, and plaster board expandable grip fasteners, which are compatible with device boxes being utilized to fulfill installation requirements for individual wiring situations. Choice of accessories is installer's code compliance option.
2. Manufacturers: Subject to compliance with requirements, provide interior outlet boxes of one of the following:

a. Adalet-PLM Div., Scott Fetzer Co.
b. Appleton Electric; Emerson Electric Co.

c. Bell Electric; Square D Company.
d. Midland-Ross Corp.
e. OZ/Gedney; General Signal Co.
f. Pass and Seymor, Inc.
g. RACO Div; Harvey Hubbell Inc.
h. Thomas and Betts Co.

C. Raintight Outlet Boxes: Provide corro sion resistant cast m etal raintight outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit holes for fastening electrical condu it, cast metal face plates with spring-hinged watertight caps suitably configurated for each application, including face plate gaskets and corrosion resistant plugs and fasteners.

1. Manufacturers: Subject to compliance with requirements, provide raintight outlet boxes of one of the following:

a. Appleton Electric; Emerson Electric Co.
b. Arrow Hart Div.; Crouse-Hinds Co.
c. Bell Electric; Square D Co.
d. Harvey Hubbell, Inc.
e. OZ/Gedney; General Signal Co.
f. Pass and Seymor, Inc.

D. Junction and Pull Boxes: Provide galv anized code-gage sheet steel junction and pull boxes, with screw-on covers; of types, shapes, and sizes to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.

1. Manufacturers: Subject to compliance with requirements, provide junction and pull boxes of one of the following:

a. Adalet-PLM Div.; Scott Fetzer Co.
b. Appleton Electric; Emerson Electric Co.
c. Arrow Hart Div.; Crouse Hinds-Co.
d. Bell Electric; Square D Company.
e. OZ/Gedney Co.; General Signal Co.
f. Spring City Electrical Mfg. Co.

E. Knockout Closures: Provide corrosion resistant box knockout closures of types and sizes, to suit respective installation requirements and applications.

1. Manufacturers: Subject to com pliance with requirem ents, provide knockout closures of one of the following:

a. Adalet-PLM Div.; Scott Fetzer Co.
b. AMP, Inc.

c. Arrow Hart Div.; Crouse-Hinds Co.
d. Appleton Electric Co.; Emerson Electric Co.
e. Bell Electric; Square D Co.
f. Midland Ross Corp.
g. Midwest Electric; Cooper Industries, Inc.
h. OZ/Gedney Co.; General Signal Co.
i. RACO Div.; Harvey Hubbell, Inc.
j. Thomas and Betts Co. Inc.

6. In-ground Hand Hole: Provide concrete hand hole with knockouts, sump, pull eyes, ground rod hole, and cast iron ring with cover. Cover shall read “Electric”. Refer to drawings for size.

1. Manufacturers: Subject to compliance with requirements, provide in-ground hand hole of one of the following:

a. Brooks Products.
b. or accepted equivalent.

PART 3 - EXECUTION

3.01 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS:

A. General: Install electrical boxes and fittings as indicated, in accordance with manufacturer's written instructions, applicable requirements of NFPA-70 and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.

B. Coordinate installation of electrical boxes and fittings with wire/cable, wiring devices, and raceway installation work.

C. Provide weathertight outlets for interior and exterior locations exposed to weather or moisture.

D. Provide knockout closures to cap unused knockout holes where blanks have been removed.

E. Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring.

F. Avoid installing boxes back-to-back in walls. Provide not less than 6" (150mm) separation.

G. Avoid installing aluminum products in concrete.

H. Position recessed outlet boxes accurately to allow for surface finish thickness.

I. Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry.

J. Provide electrical connections for installed boxes.

K. Subsequent to installation of boxes, protect boxes from construction debris and damage.

12. Install in-ground hand hole on 6" gravel base. Provide 3/4" x 10'-0" long ground rod in box and connect to counterpoise. Connect cover to ground rod with 96" long #4 AWG minimum. Install cover flush with finished grade.

3.02 GROUNDING:

A. Upon completion of installation work, properly ground electrical boxes and demonstrate compliance with requirements.

END OF SECTION

SECTION 16142 - ELECTRICAL CONNECTIONS FOR EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

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

B. This section is a Division 16 Basic Electrical Materials and Methods section, making reference to electrical connections for equipment specified herein.

1.02 DESCRIPTION OF WORK:

A. Extent of electrical connections for equipment is indicated by drawings and schedules. Electrical connections are hereby defined to include connections used for providing electrical power to equipment.

B. Applications of electrical power connections specified in this section include the following, but not limited:

1. From electrical source to motor starters.
2. From motor starters to motors.

C. Electrical connections for equipment, not furnished as integral part of equipment, are specified in other Division 16 sections, and are work of this section.

D. Junction boxes and disconnect switches required for connecting motors and other electrical units of equipment are specified in applicable Division 16 sections, and are work of this section.

E. Raceways and wires/cables required for connecting motors and other electrical units of equipment are specified in applicable Division 16 sections, and are work of this section.

F. Refer to sections of other Divisions for specific individual equipment power requirements, not work of this section.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of electrical connectors and terminals, of types and rating required, and ancillary connection materials, including

electrical insulating tape, soldering fluxes,and cable ties, whoseproducts have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Installer shall have at least 3 years ofsuccessful installation experience with projects utilizing electrical connections for equipment similar to that required for this project.

C. NFPA-70 Compliance: Comply with applicable requirements of NFPA-70 as to type products used and installation of electrical power connections (terminals and splices), for junction boxes, motor starters and disconnect switches.

D. IEEE Compliance: Comply with Std. 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to connections and terminations.

E. ANSI Compliance: Comply with applicable requirement of ANSI/NEMA and ANSI/EIA standards pertaining to products and installation of electrical connections for equipment.

F. UL Compliance: Comply with UL Std.486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors" including, but not limited to, tightening of electrical connectors to torque values indicated. Provide electrical connection products and materials, which are UL listed and labeled.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's data on electrical connections for equipment products and materials.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products ofone of the following (for each type of product):

1. Adalet-PLM Div., Scott and Fetzer Co.
2. Allen-Stevens Conduit Fittings Corp.
3. AMP Incorporated.
4. Appleton Electric Co.
5. Arrow Hart Div., Crouse Hinds Co.
6. Burndy Corp.
7. General Electric Co.

8. Harvey Hubbell Inc.
9. Ideal Industries, Inc.
10. Pyle National Co.
11. Reliable Electric Co.
12. Square D Company.
13. Thomas and Betts Corp.

2.02 MATERIALS AND COMPONENTS:

A. General: For each electrical connection indicated, provide com plete assembly of materials, including but not necessarily lim ited to, pressure connectors, term inals (lugs), electrical insulating tape, heat-shrinkable insulating tubing, cables ties, solderless wire-nuts, and other items and accessories as needed to complete splices and terminations of types indicated.

2.03 METAL CONDUIT, TUBING AND FITTINGS:

A. General: Provide m etal conduit, tubing, and fittings of types, grades, sizes, and weights (wall thickness) indicated for each type service. Where types and grades are not indicated, provide proper selection to fulfill wiring requirements, and comply with NFPA-70 requirem ents for raceways. Provide products com plying with Division 16 basic electrical m aterials and methods section "Raceways" and in accordance with the following listing of metal conduit, tubing and fittings.

1. Electrical metallic tubing (EMT).
2. EMT fittings.
3. Liquid tight flexible metal conduit.
4. Liquid tight flexible metal conduit fittings.

2.04 WIRES, CABLES AND CONNECTORS:

A. General: Provide wires, cables, and connectors complying with Division 16 basic electrical materials and methods section "Wires and Cables".

B. Wires/Cables: Unless otherwise indi cated, provide wires/cables (conductors) for electrical connections, which m atch, including sizes and ratings, of wires/cables, which are supplying electrical power. Provide copper conductors with conductivity of not less than 98% at 20 deg. C. (68 deg. F.)

C. Connectors and Terminals: Provide electrical connectors and terminals, which mate and match, including sizes and ratings, with equipm ent terminals and are recommended by equipment manufacturer for intended applications.

D. Electrical Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing and boots,wire nuts and cableties as recommended for use by accessories manufacturers for type services indicated.

PART 3 - EXECUTION

3.01 INSPECTION:

A. Inspect area and conditions under which electrical connections for equipment are to be installed and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 INSTALLATION OF ELECTRICAL CONNECTIONS:

A. Install electrical connections as indicated; in accordance with equipment manufacturer's written instructions and with recognized industry practices, and complying with applicable requirements of UL, NFPA-70, and NECA's "Standard of Installation" to ensure that products fulfill requirements.

B. Coordinate with other work, including wires/cables, raceways and equipment installation, as necessary to properly interface installment of electrical connections for equipment with other work.

C. Connect electrical power supply conductorsto equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.

D. Cover splices with electrical insulating material equivalent to, orof greater insulation resistivity ratings, than electrical insulation rating of those conductors being spliced.

E. Prepare cables and wires, by cutting and stripping covering arm or, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes, which will remain on conductors. Also avoid "ringing" copper conductors while skinning wire.

F. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing and maintenance.

G. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturers published torque-tightening values for equipment connectors. Accomplish tightening by utilizing proper torquing tools, including

torque screwdriver, bean-type torque wrench, and ratchet wrench with adjustable torque settings. W here manufacturer's torquing requirements are not available, tighten connectors and terminals to comply with torquing values contained in UL's 486A.

H. Provide flexible conduit for m otor connections, and other electrical equipm ent connections, where subject to movement and vibration.

I. Provide liquid tight flexible conduit for connections of motors and other electrical equipment where subject to movement and vibration, and also where connections are subjected to one or more of the following conditions:

1. Exterior location.
2. Moist or hum id atmosphere where condensate can be expected to accumulate.
3. Corrosive atmosphere.
4. Subject to water spray or dripping oil, grease, or water.

J. Fasten identification markers to each electrical power supply wire/cable conductor, which indicates their voltage, phase andfeeder number in accordance with Division 16 section "Electrical Identification". Affix markers on each terminal conductor, as close as possible to the point of connection.

3.03 FIELD QUALITY CONTROL:

A. Upon completion of installation of electricalconnections, and after circuitry has been energized with rated power source, test connections to dem onstrate capability and compliance with requirem ents. Ensure th at direction of rotation of each m otor fulfills requirement. Correct malfunctioning units at site, then retest to demonstrate compliance.

END OF SECTION

SECTION 16143 - WIRING DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

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

B. This section is a Division 16 Basic Electrical Materials and Methods section, and is part of each Division 16 section making reference to wiring devices specified herein.

1.02 DESCRIPTION OF WORK:

A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of electrical distribution systems which are intended to carry but not utilize electrical energy.

B. Types of electrical wiring devices in this section include the following:

1. Receptacles.
2. Ground fault circuit interrupters.
3. Switches.
4. Wallplates.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of electrical wiring devices, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Installer's Qualifications: Installer with at least 2 years of successful installation experience on projects utilizing wiring devices similar to those required for this project.

C. NFPA-70 Compliance: Comply with NFPA-70 as applicable to installation and wiring of electrical wiring devices.

D. UL Compliance: Comply with applicable requirements of UL 20, 486A, 498, and 943 pertaining to installation of
wiring devices. Provide wiring devices which are UL listed and labeled.

E. IEEE Compliance: Comply with applicable requirements of IEEE Std. 241, "Recommended Practice for Electric Power Systems in Commercial Buildings", pertaining to electrical wiring systems.

F. NEMA Compliance: Comply with applicable portions of NEMA Stds. Pub/No. WD 1, "General Purpose Wiring Devices", and WD 5 "Specific Purpose Wiring Devices".

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's data on electrical wiring devices.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide wiring devices of one of the following (for each type and rating of wiring device):

1. Leviton Mfg. Co.
2. Arrow Hart Div., Crouse Hinds Co.
3. Harvey Hubbell Inc.
4. Pass and Seymour Inc.

2.02 FABRICATED WIRING DEVICES:

A. General: Provide factory fabricated wiring devices, in types, colors, and electrical ratings for applications indicated and which comply with NEMA Stds. Pub/No. WD 1. Provide ivory color devices and wallplates except as otherwise indicated; color selection to be verified by Contractor with Architect/Engineer.

2.03 RECEPTACLES:

A. General Duty Duplex: Provide duplex general duty type receptacles, 2 pole, 3 wire, grounding, with green hexagonal equipment ground screw, ground terminals and poles internally connected to mounting yoke, 20 amperes, 125 volts, with metal plaster ears; design for side and back wiring with spring loaded, screw activated pressure plate, with NEMA configuration 5-20R unless otherwise indicated.

B. Provide black colored receptacles with surge suppressors for computer equipment use where indicated.

2.04 GROUND FAULT INTERRUPTERS:

A. Provide ground fault circuit interrupters, with heavy duty duplex receptacles, capable of being installed in a 2-3/4" deep outlet box without adapter, grounding type UL rated Class A, Group 1, rated 20 amperes, 120 volts, 60 Hz; with solid state ground fault sensing and signaling; with 5 milliamperes ground fault trip level; equip with NEMA configuration 5-20R.

PART 3 - EXECUTION

3.01 INSTALLATION OF WIRING DEVICES:

A. Install wiring devices as indicated, in accordance with manufacturer's written instructions, applicable requirements of NFPA-70 and NECA's "Standard of Installation" and in accordance with recognized industry practices to fulfill project requirements.

B. Coordinate with other work, including painting, electrical boxes and wiring work, as necessary to interface installation of wiring devices with other work.

C. Install wiring devices only in electrical boxes which are clean, free from excess building materials, dirt and debris.

D. Install wiring devices after wiring work is completed.

E. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for wiring devices. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds. 486A and B. Use properly scaled torque indicating hand tool.

3.02 PROTECTION OF WALLPLATES AND RECEPTACLES:

A. Upon installation of wallplates and receptacles, advise Contractor regarding proper and cautious use of convenience outlets. At time of Substantial Completion, replace those items which have been damaged, including those burned and scored by faulty plugs.

3.03 GROUNDING:

A. Provide equipment grounding connections for wiring devices, unless otherwise indicated. Tighten connections to comply with tightening torques specified in UL Std. 486A to assure permanent and effective grounds.

3.04 TESTING:

A. Prior to energizing circuitry, test wiring for electrical continuity, and for short circuits. Ensure proper polarity of connections is maintained. Subsequent to energization, test wiring devices to demonstrate compliance with requirements.

END OF SECTION

SECTION 16170 - CIRCUIT AND MOTOR DISCONNECTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Division 16 Basic Electrical Materials and Methods section apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of circuit and motor disconnect switch work is indicated on drawings and schedules.

B. Types of circuit and motor disconnect switches in this section include the following:

1. Equipment disconnects.
2. Motor circuit disconnects.

C. Refer to other Division 16 sections for wires/cables, raceways, and electrical boxes and fittings work required in connection with circuit and motor disconnect work; not work of this section.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of circuit and motor disconnect switches of types and capacitiesrequired, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Installer's Qualifications: Installer with at least 3 years of successful installation experience with projects utilizing circuit andmotor disconnect work similar to that required for this project.

C. NFPA-70 Compliance: Comply with NFPA-70 requirements pertaining to construction and installation of electrical circuit and motor disconnect devices.

D. UL Compliance: Comply with requirements of UL 98, "Enclosed and Dead Front Switches". Provide circuit and motor disconnect switches which have been UL listed and labeled.

E. NEMA Compliance: Comply with applicable requirements of NEMA Stds. Pub.

No. KS 1, "Enclosed Switches" and 250 "Enclosures for Electrical Equipment" (1000 volts maximum).

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's data on circuit and motor disconnect switches.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide circuit and motor disconnects of one of the following (for each type of switch):

1. Square D.
2. General Electric Co.
3. Siemens (ITE).

2.02 FABRICATED SWITCHES:

A. Heavy Duty Safety Switches: Provide surface mounted, heavy duty type, sheet steel enclosed safety switches, of types, sizes and electrical characteristics indicated; fusible and non-fusible type, and incorporating quick-make, quick-break type switches; construct so that switch vacu-break mechanism is visible in the OFF position. Equip with operating handle which is integral part of enclosure base and whose operating position is easily recognizable, and is pad lockable in OFF position; construct current carrying parts of high conductivity copper, with silver tungsten type switch contacts, and positive pressure type reinforced fuse clips. Provide NEMA type enclosures as required and rejection clips.

2. Coordinate the required size of all safety switches feeding equipment, (i.e. motors, owner furnished equipment, etc.) with approved equipment shop drawings and owner representatives prior to ordering disconnects. Safety switches shall be sized per the NEC, the equipment name plate and manufactures recommendations.

2.03 FUSES:

A. Provide fuses for safety switches, as recommended by switch manufacturer, of classes, types, and ratings needed to fulfill electrical requirements for service indicated.

PART 3 - EXECUTION

3.01 INSTALLATION OF CIRCUIT AND MOTOR DISCONNECT SWITCHES:

A. Install circuit and motor disconnect switches as indicated complying with manufacturer's written instructions, applicable requirements of NFPA-70, NEMA and NECA's "Standard of Installation", and in accordance with recognized industry practices.

B. Coordinate circuit and motor disconnect switch installation work with electrical raceway and cable work, as necessary for proper interface.

C. Install disconnect switches for use with motor driven appliances, and motors and controllers within 6'-0" of controller position unless otherwise indicated.

3.02 GROUNDING:

A. Provide equipment grounding connections, sufficiently tight to assure a permanent and effective ground, for electrical disconnect switches.

3.03 FIELD QUALITY CONTROL:

A. Subsequent to completion of installation of electrical disconnect switches, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunction units at project site, then retest to demonstrate compliance; otherwise remove and replace with new units and retest.

END OF SECTION

SECTION 16180 - OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. This section is a Division 16 Basic Materials and Methods section, and is part of each Division 16 section making reference to overcurrent protective devices specified herein.

1.02 DESCRIPTION OF WORK:

A. Extent of overcurrent protective device work is indicated by drawings and schedules.

B. Types of overcurrent protective devices in this section include the following:

1. Circuit Breakers:

a. Molded case.

C. Refer to other Division 16 sections for cable/wire and connector work required in conjunction with overcurrent protective devices; not work of this section.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of overcurrent protective devices, of types, sizes, and ratings required, whose products have been in satisfactory use in similar services for not less than 5 years.

B. Installer: Qualified with at least 5 years of successful installation experience on projects with electrical installation work similar to that required for projects.

C. NFPA-70 Compliance: Comply with NFPA-70 requirements as applicable to construction and installation of overcurrent protective devices.

D. UL Compliance: Comply with applicable requirements of UL 489, "Molded Case Circuit Breakers and Circuit Breaker Enclosures. Provide overcurrent protective devices, which are UL, listed and labeled.

E. NEMA Compliance: Comply with applicable requirements of NEMA Std. Pub. Nos. AB 1, AB 2, and SG 3 pertaining to molded case and low voltage power type circuit breakers.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's data on overcurrent protective devices, including: amperes, voltages, and current ratings, interrupting ratings, current limitations, internal inductive and non-inductive loads, time current trip characteristic curves, and mounting requirements.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products of one of the following (for each type and rating of overcurrent protective device).

1. Circuit Breakers:

a. Square D Co.
b. General Electric Co.
c. Siemens (ITE).

2.02 CIRCUIT BREAKERS:

A. General: Except as otherwise indicated, provide circuit breakers and ancillary components, of types, sizes, ratings and electrical characteristics indicated, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information and as required for a complete installation.

B. Molded Case Circuit Breakers: Provide factory assembled, molded case circuit breakers of frame size indicated. Provide breakers with permanent thermal and instantaneous magnetic trips in each pole, and with fault current limiting protection, ampere rating as indicated. Construct with overcenter, trip free, toggle type operating mechanisms with quick-make, quick-break action and positive handle trip indication. Provide push-to-trip button on cover for mechanical tripping circuit breakers. Construct breakers for mounting and operating in any physical position and operating in an ambient temperature of 40 deg. C. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated.

3. Coordinate the required size of all circuit breakers feeding equipment, (i.e. motors,

owner furnished equipment, etc.) with approved equipment shop drawings and owner representatives prior to ordering circuit breakers. Breakers shall be sized per NFPA-70, the equipment nameplate, and per manufacturer's recommendations.

PART 3 - EXECUTION

3.01 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES:

A. Install overcurrent protective devices as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. The arrangements of overcurrent protective devices have been worked out for phase balancing and the like and shall be followed as closely as actual construction will permit. Comply with NFPA-70 and NEMA standards for installation of overcurrent protective devices.

B. Coordinate with other work, including electrical wiring work, as necessary to interface installation of overcurrent protective devices with other work.

C. Fasten circuit breakers without causing mechanical stresses, twisting or misalignment being exerted by clamps, supports, or cabling.

D. Set field adjustable circuit breakers for trip settings as indicated, subsequent to installation of units.

3.02 ADJUST AND CLEAN:

A. Inspect circuit breakers operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

3.03 FIELD QUALITY CONTROL:

A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short circuits. Correct malfunction units, and then demonstrate compliance with requirements.

END OF SECTION

SECTION 16195 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

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

B. Division 16 Basic Electrical Materials andMethods section apply to work specified in this section.

1.02 DESCRIPTION OF WORK:

A. Extent of electrical identification work is indicated by drawings and schedules.

B. Types of electrical identification work specified in this section include the following:

1. Electrical power, control and communication conductors.
2. Operational instructions and warnings.
3. Danger signs.
4. Equipment/system identification signs.

C. Refer to Division 1 general requirements section "Identification Systems", for equipment and system nameplates, and performance data, not work of this section.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of electrical identification products of types required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. NFPA-70 Compliance: Comply with NFPA-70 as applicable to installation of identifying labels and markers for wiring and equipment.

C. UL Compliance: Comply with applicable requirements of UL Std.969, "Marking and Labeling Systems" pertaining to electrical identification systems.

D. NEMA Compliance: Comply with applicable requirements of NEMA Std. No's. WC-1 and WC-2 pertaining to identification of power and control conductors.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's data on electrical identification materials and products.

B. Samples: Subm it samples of each co lor, lettering style and other graphic representation required for each identification material or system.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturers: Subject to com pliance with requirements, provide electrical identification products of one of the following (for each type marker):

1. Alarm Supply Co., Inc.
2. Brady, W.H. Co.
3. Calpico Inc.
4. Cole Flex Corp.
5. Direct Safety Co.
6. George Ingraham Corp.
7. Griffolyn Co.
8. Ideal Industries, Inc.
9. LEM Products, Inc.
10. Markal Co.
11. National Band and Tag Co.
12. Panduit Corp.
13. Seton Name Plate Co.
14. Tesa Corp.

2.02 ELECTRICAL IDENTIFICATION MATERIALS:

A. General: Except as otherwise indicated,provide manufacturer's standard product of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.

B. Color Coded Plastic Tape:

1. General: Provide manufacturer's standard self-adhesive vinyl tape not less than 3 mils thick by 1-1/2" wide.

C. Cable/Conductor Identification Bands:

1. General: Provide m anufacturer's standard vinyl cloth self adhesive cable/conductor markers of wrap-around type, either pre-numbered plastic coated type, or write-on type with cl ear plastic self-adhesive cover flap; numbered to show circuit identification.

D. Baked Enamel Danger Signs:

1. General: Provide manufacturer's standard "DANGER" signs of baked enamel finish on 20 gage steel, of standard red, black, and white graphics; 14" x 10" size except where 10" x 7" is the largest size which can be applied where needed, and except where larger size is needed for adequate vision; with recognized standard explanation wording, e.g., HIGH VOLTAGE, KEEP AWAY, BURIED CABLE, DO NOT TOUCH SWITCH.

E. Engraved Plastic Laminate Signs:

1. General: Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in sizes and thickness indicated, engraved with engraver's standard letter style of sizes and wording indicated, black face and white core plies (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
2. Thickness: 1/16" except as otherwise indicated.
3. Thickness: 1/8" except as otherwise indicated.
4. Thickness: 1/16" for units up to 20 sq. in. or 8" length; 1/8" for larger units.
5. Fasteners: Self tapping stainless steel screws, except contact type permanent adhesive where screws cannot or should not penetrate substrate.

2.03 LETTERING AND GRAPHICS:

A. General: Coordinate names, abbreviations and other designations used in electrical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturer or as required for proper identification and operation/maintenance of electrical system and equipment. Comply with ANSI A13.1 pertaining to minimum sizes for letters and numbers.

PART 3 - EXECUTION

3.01 APPLICATION AND INSTALLATION:

A. General Installation Requirements:

1. Install electrical identification products as indicated, in accordance with manufacturer's written instructions, and requirements of NFPA-70.
2. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.
3. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.

B. Conduit Identification:

1. General: Where electrical conduit is exposed in spaces with exposed mechanical piping which is identified by color-coded method, apply color

coded identification on electrical conduit in manner similar to piping identification. Except as otherwise indicated, use white as coded color for conduit.

C. Cable/Conductor Identification:

1. General: Apply cable/conductor identification, including voltage, phase and feeder number, on each cable/conductor in each box/enclosure/cabinet where wires of more than one circuit or communication/signal system are present, except where another form of identification (such as color-coded conductors) is provided. Match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project's electrical work.

D. Operational Identification and Warnings:

1. General: Wherever reasonably required to ensure safe and efficient operation and maintenance of electrical systems, and electrically connected mechanical systems and general systems and equipment, including prevention of misuse of electrical facilities by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets, and other controls, devices and covers of electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for intended purposes.

E. Danger Signs:

1. General: In addition to installation of danger signs required by governing regulations and authorities, install appropriate danger signs at locations indicated and at locations subsequently identified by Installer of electrical work as constituting similar dangers for persons in or about project.
2. High Voltage: Install danger signs wherever it is possible under any circumstances, for persons to come into contact with electrical power of voltages higher than 110-120 volts.

F. Equipment/Systems Identification:

1. General: Install engraved plastic-laminate signs on each major unit of electrical equipment in building; including central or master unit of each electrical system including communication/ control/signal systems, unless unit is specified with itsown self-explanatory identification or signal system Except as otherwise indicated, providesingle line of text, 1/2" high lettering on 1-1/2" high sign (2" high where 2 lines are required), white lettering in black field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the

following categories of electrical work:

a. Panelboards, electrical cabinets and enclosures.
b. Disconnect switches

G. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate substrate.

END OF SECTION

SECTION 16420 - SERVICE ENTRANCE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawing and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications sections, apply to work of this section.

B. Division 16 Basic Electrical Materials and Methods sections apply to work specified in this section.

1.02 DESCRIPTION OF WORK:

A. Extent of service entrance work is indicated by drawings and schedules.

B. Types of service entrance equipment in this section includes the following:

1. Main Shunt Trip Circuit Breaker.

C. Refer to other Division 16 sections for wires/cables, raceways, and electrical boxes and fittings work required in connection with service entrance equipment; not work of this section.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of service entrance equipment of types, sizes and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Installer shall have at least 5 years of successful installation experience with projects utilizing service entrance work similar to that required for this project.

C. NFPA-70 Compliance: Comply with NFPA-70 as applicable to construction and installation of service entrance equipment and accessories.

D. NEMA Compliance: Comply with construction and installation requirements of the following NEMA standards for service-entrance equipment and accessories:

1. Std. Pub. No. AB 1; Molded Case Circuit Breakers.
2. Std. Pub. No. PB 1; Panelboards

3. Std. Pub. No. PB1, Deadfront Distribution Switchboards

E. UL Compliance: Comply with construction and installation requirements of the following UL standards for service entrance equipment and accessories:

1. UL 50; Electrical Cabinets and Boxes.
2. UL 854; Service Entrance Cables.
3. UL 869; Electrical Service Equipment.

F. Provide service entrance equipment, and accessories which are UL listed and labeled, and marked "SUITABLE FOR USE AS SERVICE EQUIPMENT".

G. IEEE Compliance: Comply with applicable requirements of IEEE Std. 241 pertaining to service entrances.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's data on service entrance equipment and accessories.

B. Shop Drawings: Submit dimensioned layouts of service entrance equipment, including spatial relationship to proximate electrical equipment.

PART 2 - PRODUCTS

2.01 SERVICE ENTRANCE EQUIPMENT:

A. General: Provide service entrance equipment and accessories of types, sizes, ratings, and electrical characteristics indicated, which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation; and as herein specified.

B. Overcurrent Protection Devices:

1. General: Provide overcurrent protective devices complying with Division 16 Basic Electrical Materials and Methods section "Overcurrent Protective Devices".

C. Cable/Wire:

1. General: Provide cable/wire complying with Division 16 Basic Electrical Materials and Methods section "Wires and Cables".

D. Raceways:

1. General: Provide raceways complying with Division 16 Basic Electrical Materials and Methods section "Raceway".

E. Bussing shall be copper bus bars and full size neutral unless noted otherwise.

2.02 SERVICE ENTRANCE ACCESSORIES:

A. Wall and Floor Seals: Provide wall and floor seals complying with Division 16 Basic Electrical Materials and Methodssection "Supporting Devices" in accordance with the following listing:

1. Wall and Floor Seals.

PART 3 - EXECUTION

3.01 INSTALLATION OF SERVICE ENTRANCE EQUIPMENT:

A. Install service entrance equipment as indicated, in accordance with equipment manufacturer's written instructions, and withrecognized industry practices, to ensure that service entrance equipment fulfills requirements. Comply with applicable installation requirements of NFPA-70 and NEMA standards.

B. Coordinate with other electrical work, including utility company wiring, as necessary to interface installation of service entrance equipment work with other work.

C. Install fuses, if any, in service entrance equipment.

3.02 GROUNDING:

A. Provide equipment bonding and grounding connectors, sufficiently tight to assure a permanent and effective
ground, for service entrance equipment and wiring/cabling as indicated.

B. Ground bus shall be copper.

3.03 ADJUST AND CLEAN:

A. Adjust operating mechanisms for free mechanical movement.

B. Touch-up scratched or marred enclosure surfaces to match original finishes.

3.04 FIELD QUALITY CONTROL:

A. Upon completion of installation of service entrance equipment and electrical circuitry, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunction units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and retest.

END OF SECTION

SECTION 16425 - SWITCHBOARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

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

B. Division 16 Basic Electrical Materials andMethods section apply to work specified in this section.

1.02 DESCRIPTION OF WORK:

A. Extent of switchboard work is indicated by drawings and schedules.

B. Type of switchboard specified in this section includes the following:

1. Dead Front Distributions.

a. Circuit breaker switchboard.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of switchboards, of types, sizes, and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installers Qualifications: Installer with at least 5 years of successful installation experience on projects utilizing switchboards similar to those required for this project.

C. NFPA-70 Compliance: Comply with NFPA-70 as applicable to wiring methods, construction and installation of switchboards.

D. UL Compliance: Comply with applicable requirements of Std. 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors", and Std. 891, "Dead-Front Electrical Switchboard", pertaining to installation of switchboards. Provide switchboards and components which are UL listed and labeled.

E. IEEE Compliance: Comply with applicable requirements of IEEE Std. 241, "Recommended Practice for Electric Power

Systems in Commercial Buildings", pertaining to switchboards.

F. ANSI Compliance: Comply with applicable requirements of ANSI standards pertaining to switchboard assemblies.

G. NEMA Compliance: Comply with applicable portions of NEMA Stds. Pub. No. PB 2, "Dead Front Distribution Switchboards".PB 2.1, "Instructions for Safe Handling, Installation, Operation and Maintenance ofSwitchboards", and SG 3, "Low Voltage Power Circuit Breakers", pertaining to switchboard assemblies.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's data on switchboard including, but not limited to, voltages, number of phases, frequencies and short circuit and continuous current ratings. Provide application data for branch circuit breakers, sections, main buses and basic insulation levels.

B. Shop Drawings: Submit layout drawings ofswitchboard showing accurately scaled basic equipment sections including auxiliary compartments, section components, and combination sections. Where equipment selected is from an acceptable manufacturer other than the design basis indicated in the documents, provide a 1/4" = 1'-0" scale plan view of room where equipment is being installed. Plan view shall show all equipment to be located in room and all working clearances required about equipment accurately scaled. Provide additional elevations and sections of room where plan view is not sufficient to show all conditions encountered.

1.05 Series rating of panelboards is not acceptable.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide switchboard of one of the following (for each type and rating of switchboard):

1. Square D Co.
2. Siemens (ITE).
3. General Electric Co.

2.02 EQUIPMENT SECTIONS AND COMPONENTS:

A. General: Except as otherwise indicated, provide switchboards and ancillary

components of types, sizes, characteristics, and ratings indicated, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, and as required for complete installation.

B. AC Dead Front Distribution Switchboard: Provide factory assembled, dead front, metal enclosed, self supporting secondary power switchboard, of type, size and electrical rating and characteristics indicated; consisting of panel (vertical) units, and containing circuit breakers of quantities, ratings and types indicated. Provide copper main bus and connections to switching devices and circuit breaker branches of sufficient capacity to limit rated continuous current operating temperature rise of no greater than 65°C. above average ambient temperature of 30°C.; with main bus and tap connections silver surfaced and bolted tightly according to manufacturer's torquing requirements for maximum conductivity. Brace bus for short circuit stresses up to maximum conductivity. Prime and coat switchboard with manufacturer's standard finish and color. Equip units with built-in lifting eyes and yokes; and provide individual panel (vertical) units, suitable for bolting together at project site. Construct switchboard units for the following environment:

1. Installation: Indoors, NEMA , Type 1. Outdoors, NEMA, Type 3R, unless noted otherwise.

C. Enclosures: Construct dead-front switchboard, suitable for floor mounting, with front cabling/wiring accessibility, and conduit accessibility as indicated. Provide welded steel channel framework; wireway front covers to permit ready access to branch circuit breaker load side terminals. Coat enclosures with manufacturer's standard corrosive resistant finish.

D. Circuit Breakers: Provide circuit breakers of types, ratings, and number of poles indicated; construct as follows:

1. Type: Molded case.

E. Circuit Breakers; Provide circuit breakers complying with Division 16 Basic Electrical Materials and Methods section "Overcurrent Protective Devices", in accordance with the following listing:

1. Molded case circuit breakers.

F. Busing: Provide switchboard busing with sufficient cross sectional area to fulfill UL Std. 891 pertaining to temperature rise. Construct fully rated through bus of tin plated copper with short circuit current rating as indicated on the panel schedules.

E. Current Limiting Circuit Breakers: Provide (where indicated) current limiting circuit breaker assemblies with time delay thermal and instantaneous magnetic trips, and fault current limiting protection. Construct units with ampere ratings as indicated, with interrupting rating of 42,000.

F. Coordinate the required size of all circuit breakers feeding equipment, (i.e. motors, HVAC, kitchen equipment, special purpose outlets, elevators, owner furnished equipment, etc.) with approved equipment shop drawings and owner representatives prior to ordering switchboards. Breakers shall be sized per the NEC, the equipment name plate and manufactures recommendations.

G. The power company shall be contacted within 10 days of the award of the contract by the contractor to verify the actual available short circuit. Fault current (SCC) at the transformer secondary bushings. The contractor shall provide switchboards which have AIC/withstand ratings greater than the available SSC.

PART 3 - EXECUTION

3.01 INSPECTION:

A. Installer must examine areas and conditions under which switchboard and components are to be installed, and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 INSTALLATION:

A. Install switchboard as indicated, in accordance with manufacturer's written instructions, and with recognized industry practices; complying with applicable requirements of NFPA-70, NEMA's Std. PB 2.1, and NECA's "Standard Of Installation". Where indicated on drawings, provide reinforced concrete pad sized 3" larger than equipment on all sides, minimum, for floor mounted equipment.

B. Coordinate with other work including electrical cabling/wiring work as necessary to interface installation of switchboard with other work.

C. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Std. 486A.

D. Install fuses in switchboard, if any.

3.03 ADJUSTING AND CLEANING:

A. Adjust operating mechanisms for free mechanical movement.

B. Touch-up scratched or marred surfaces to match original finishes.

3.04 GROUNDING:

A. Provide equipment grounding connections for switchboard as indicated. Tighten connections to comply with tightening torques specified in UL Std. 486A to assure permanent and effective grounds.

3.05 FIELD QUALITY CONTROL:

A. Prior to energization of circuitry, checkall accessible connections to manufacturer's tightening torque specifications.

B. Prior to energization of switchboar d, check with ground resistance tester phase-to-phase and phase-to-ground insula tion resistance levels to ensure requirements are fulfilled.

C. Prior to energization, check switchboard forelectrical continuity of circuits, and for short circuits.

D. Subsequent to wire and cable hook- ups, energize switchboard and dem onstrate functioning in accordance with require ments. W here necessary, correct malfunctioning units, and then retest to demonstrate compliance.

END OF SECTION

SECTION 16450 - GROUNDING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

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

B. Division 16 Basic Materials and Methods sections apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of grounding work is indicated by drawings and schedules.

B. Types of grounding specified in this section include the following:

1. Solid Grounding.

C. Applications of grounding work in this section include the following:

1. Underground metal water piping.
2. Grounding electrodes.
3. Grounding rods.
4. Service equipment.
5. Enclosures.
6. Equipment.
7. Ground Test Well.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of electrical connectors, terminals and fittings, of types and ratings required, and ancillary grounding materials, including stranded cables, copper brain and bus, ground rods and plate electrodes, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Installer: Qualified with at least 3 years of successful installation experience on projects with electrical grounding work similar to that required for project.

C. NFPA-70 Compliance: Comply with NFPA-70 requirements as applicable to materials and installation of electrical grounding systems, associated equipment and

wiring. Provide grounding products which are UL listed and labeled.

D. UL Compliance: Comply with applicable requirements of UL Standards Nos.467 and 869 pertaining to electrical grounding and bonding.

E. IEEE Compliance: Comply with applicable requirements of IEEE Standard 142 and 241 pertaining to electrical grounding.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's data on grounding systems and accessories.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide grounding products of one of the following:

1. B-Line Systems, Inc.
2. Burndy Corp.
3. Crouse-Hinds Co.
4. Electrical Components Div.; Grould, Inc.
5. General Electric Supply Co.
6. Ideal Industries, Inc.
7. Thomas and Betts Corp.
8. Western Electric Co.

2.02 GROUNDING SYSTEMS:

A. Materials and Components:

1. General: Except as otherwise indicated, provide electrical grounding systems indicated; with assembly of materials, including, but not limited to, cables/wires, connectors, terminals (solderless lugs), grounding rods/electrodes, and plate electrodes, bonding jumper braid, surge arrestors, and additional accessories needed for complete installation. Where more than one type unit meets indicated requirements, selection is Installer's option. Where materials or components are not indicated, provide products complying with NFPA-70, UL, IEEE, and established industry standards for applications indicated.

2. Provide raceways, and electrical boxes and fittings complying with Division

16 Basic Materials and Methods sections "Raceways" and "Electrical Boxes and Fittings", in accordance with the following listing:

a. Electrical metallic tubing.
b. Liquid-tight flexible metal conduit.
c. Rigid metal conduit fittings.
d. EMT Fittings, Type 1.
e. Liquid-tight flexible metal conduit fittings.

B. Conductors: Unless otherwise indicated, provide electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NFPA-70.

C. Bonding Jumper Braid: Copper braided tape, constructed of 30-gage bare copper wires and properly sized for indicated applications.

D. Flexible Jumper Strap: Flexible flat conductor, 480 strands of 30-gage bare copper wire; 3/4" wide, 9-1/2" long; 48,250 cm. Protect braid with copper bolthole ends with holes sized for 3/8" dia. bolts.

E. Ground Rods: Steel with copper welded exterior. Each ground rod shall consist of a 40 ft. ground rod, 5/8" driven vertically. Top of ground rod shall be at least one (1) foot deep below grade.

F. Electrical Grounding Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, welding materials, bonding straps, as recommended by accessories manufacturers for type services indicated.

G. Ground Test Well: Plastic 10" diameter x 10" high body with two pipe slots; plastic snap-lock cover with lifting holes and shall read "Ground". Provide test well at each ground rod location. Cover shall be flush with grade.

H. Grounding Bars: Ground bars shall be copper of the size and description as shown on the drawings, or shall be 1/4" x 2" bus grade copper, spaced from wall on insulating 1" high supports, of 6" or greater O.A. length, allowing 2" length per lug connected thereto.

PART 3 - EXECUTION

3.01 GENERAL

A. Grounding conductors shall be provided with every circuit.

B. Grounding conductors shall; be so installed as to permit shortest and most direct path from equipment to ground; be installed in metal conduit with both conductor and conduit bonded at each end; have connections accessible for inspection and made

with approved solderless connectors brazed (or bolted) to the equipment or structure to be grounded. The main grounding electrode conductor shall be exothermically welded to ground rods and water pipe.

C. All contact surfaces shall be thoroughly cleaned before connections are made to insure good metal-to-metal contact.

D. All exterior grade mounted equipment shall have their enclosures grounded directly to a separate driven ground at the equipment in addition to the building ground connection.

3.02 BONDING

A. Where available on the premises, bond the following items together:

1. Metal water pipe.
2. Building metal frame.

B. A main ground, bare copper conductor, NEC sized but in no case less than #2/0, shall be run in conduit from the Main Switchgear of each building to the building steel in respective building. This ground conductor shall also be run individually and be bonded to the main water service ahead of any union in pipe and must be metal pipe of length as acceptable by authorities having jurisdiction. Provide properly sized bonding shunt around water meter and/or dielectric unions in the water pipe. Also required is the same size ground wire to minimum 5/8" x 20 ft. copperweld driven ground rod.

C. Install ground bushings on all conduits entering enclosures where the continuity of grounding is broken between the conduit and enclosure (i.e. conduit stub-up into a motor control center enclosure). Provide an appropriately sized bond jumper from the ground bushing to the equipment ground bus.

3.03 INSTALLATION AND METHODS - 120 THROUGH 480 VOLT SYSTEMS

A. Except as otherwise indicated, each feeder raceway on the load side of the service entrance shall contain a ground conductor sized as indicated and where not shown shall be sized in accordance with Table 250-95 of the NEC. Conductor shall be connected to the equipment grounding bus in switchboards and panelboards, to lighting fixtures, motors and other types of equipment and outlets. The ground shall be in addition to the metallic raceway and shall be properly connected thereto, using a lug device located within each item enclosure at the point of electric power connections to permit convenient inspection.

B. Each feeder metallic conduit shall be bonded at all discontinuities, including at switchboards and all sub-distribution and branch circuit panels with conductors in accordance with Table 250-95 of NEC for parallel return with respective interior

grounding conductor.

C. Provide green insulated ground wire for all grounding type receptacles and for equipment of all voltages. In addition to grounding strap connection to metallic outlet boxes, a supplemental grounding wire and screw equal to Raco No. 983 shall be provided to connect receptacle ground terminal to the box.

D. All plugstrips and metallic surface raceway shall contain a green insulation ground conductor from supply panel ground bus connected to grounding screw on each receptacle in strip and to strip channel. Conductor shall be continuous.

3.04 MOTORS AND EQUIPMENT

A. All motors, all heating coil assemblies, and all building equipment requiring flexible connections shall have a green grounding conductor properly connected to the frames and extending continuously inside conduit with circuit conductors to the supply source grounding bus with approved connectors regardless of conduit size or type. This shall include Food Service equipment, Laundry equipment, and all other "Equipment By Owner" to which an electric conduit is provided under this Division.

3.05 TRANSFORMER GROUNDING

A. Grounding of transformers and enclosures of 120/208V and 277/480V "separately derived systems" shall be to the nearest grounding electrode, grounded structural steel (when accessible), effectively grounded metal water pipe, or other approved electrodes when the former are not available as required by the N.E.C. (Where ground electrode per N.E.C. is the grounded structural steel, all additional ground wire (sized per N.E.C.) shall be connected to effectively grounded metal water pipe.

B. In addition, work shall include a conduit with an N.E.C. sized grounded conductor to main building ground system except where specifically rejected by Local Inspection Authority. Verify during construction procedures.

3.06 MISCELLANEOUS GROUNDING CONNECTIONS

A. Required connections to building steel shall be with approved terminals and bolted in accessible locations.

B. Where reinforced concrete is utilized for building grounding system (UFER ground), proper reinforced bonding shall be provided to secure low resistance to earth with "thermite" type devices, and #10AWG wire ties shall be provided to not less than ten (10) full length rebars which contact the connected rebar (by Division 16 contractor).

C. All surfaces to which grounding connections are made shall be thoroughly cleaned to maximum conductive condition immediately before connections are made thereto. Exposed bare metal at the termination point shall be painted.

D. Welded or Brazed Connections: Joints in ground conductors shall be welded or brazed. The welding or brazing processes shall be an exothermic type.

3.07 MAIN ELECTRICAL SERVICE GROUNDING AND BONDING (AS APPLICABLE)

A. Ground in accordance with Article 250 of the NEC. Artificial grounding electrodes shall be provided for the main service grounding in sufficient number and configuration to secure grounding resistance specified. Grounding system shall also be extended to the cold water entrance pipe and be grounded to the line side of any metering.

B. Provide counterpoise at service entrance of minimum of three driven ground rods of adequate length spaced 20 feet apart in a triangle, or as detailed. Conductor size between ground rods shall be in compliance with N.E.C. Connections to ground rods shall be thermowelded. Top of ground rods and conductors shall be minimum 24 inches below grade. Connect to building lightning protective counterpoise with #2/0 cable.

3.08 TESTING AND REPORTS

A. Raceway Continuity: Metallic raceway system as a component of the facilities ground system shall be tested for electrical continuity. Resistance to ground throughout the system shall not exceed NEC specified limits.

B. Ground resistance measurements shall be made on each grounding system utilized in the project. The ground resistance measurements shall include building structural steel, driven grounding system, and other approved systems as may be applicable. Ground resistance measurements shall be made in normally dry weather, not less than 24 hours after rainfall, and with the ground under test isolated from other grounds. Resistances measured shall not exceed specified limits.

C. Upon completion of testing, the testing conditions and results shall be certified by the Contractor and submitted in writing on Contractor's letterhead to the Architect/Engineer.

3.09 GROUND RESISTANCE

A. Grounding resistance measure at main service shall not exceed 10 ohms.

B. Resistance to ground of all non-current carrying metal parts shall not exceed 25 ohms, measured at motors, panels, grounding busses, cabinets, etc.

END OF SECTION

SECTION 16500 - SPORTS LIGHTING

PART 1: GENERAL

1.1 SUMMARY

A. MUSCO is the sole provider for the field lighting as standardization using MUSCO has approved. 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 Barnett 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. 1 – 330' x 225' Soccer Field

D. The primary goals of this sports lighting project are:

1. Provide long term I.E.S. Class III lighting for Soccer 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 m ethods for maintaining light levels. Either is acceptable under the conditions set forth in the specifications.

A. METHOD #1 – AUTOMATED TIMED POWER ADJUSTMENT SYSTEM – Performance Requirements: Playing surfaces shall be lit to an average light level and uniformity as specified in the chart below. Light levels are not to fall below the target values 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 Target Light Levels	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Soccer	30 fc	3.0:1.0	96	30' x 30'

Based on anticipated hours of usage (450 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).

B. METHOD #2 – Continuous Depreciation 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 METHOD #1 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 (450 hours per year), METHOD #2 systems would require a minimum of 5 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	43 fc	30 fc	3.0:1.0	96	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 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.
2. 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 Fields	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.

Soccer

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 15.0 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 the target degrees needed to achieve a candela reading of 10,000. For example on the baseball A poles: If 10,000 candela is achieved at 19.5 degrees above vertical and the target is 15.0, a minimum mounting height of 95' (4.5 degrees x 3.33') would be required for the poles.

1.4 LIFE CYCLE COSTS

A. Energy Consumption: The max kWh consumption for the field lighting system is designed to be 54.4kW or less for Soccer

B. Complete Lamp Replacement: Manufacturer shall include all group lamp replacements required to provide 25 years of operation based upon 450 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 .186 (kWh rate) x 450 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 that can respond with 2 hours. 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 such a not to delay the contractor. A schedule of when the equipment will arrive at the site shall be provided at the project kick-offf meeting.

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.
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 Contractor shall be liable to any or all of the following:

1. Contractor shall at his expense provide and install any necessary additional fixtures to meet the minimum lighting standards. The Contractor 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. Contractor 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 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.

END OF SECTION

APPENDIX A

for

NEW SOCCER FIELD AT BARNETT PARK
ORANGE COUNTY, FLORIDA

Sports Lighting Information

Musco Lighting is the Basis of Design

MUSCO Lighting is the standard for County Parks and cannot be substituted

Control System Summary

Project Specific Notes:

Project Information

Project #:	168815
Project Name:	Barnett Park Football Phase II
Date:	04/28/14
Project Engineer:	Jake Van Polen
Sales Representative:	Bob DeCouto
Control System Type:	Control and Monitoring
Communication Type:	Digital Cellular
Scan:	168815C
Document ID:	168815P1V1-0428150753
Distribution Panel Location or ID:	Barnett Park FB
Total # of Distribution Panel Locations for Project:	1
Design Voltage/Hertz/Phase:	480/60/3
Control Voltage:	120

Equipment Listing

DESCRIPTION	APPROXIMATE SIZE
1.Control and Monitoring Cabinet	24 X 48
2.Surge Protection Device	6 X 10

	QTY	SIZE
Total Contactors	4	30 AMP
Total Off/On/Auto Switches:	1	

Materials Checklist

Contractor/Customer Supplied:

- ❑ A single control circuit must be supplied per distribution panel location.
  - — If the control voltage is NOT available, a control transformer is required.
- ❑ Electrical distribution panel to provide overcurrent protection for circuits
  - — Thermal/Magnetic circuit breaker sized per full load amps on Circuit Summary by Zone Chart
- ❑ Wiring:
  - — Dedicated control power circuit
  - — Power circuit to and from lighting contactors
  - — Monitoring circuit from surge protection device to Control and Monitoring cabinet 1
  - — Harnesses for cabinets at remote locations
  - — Means of grounding, including lightning ground protection
- ❑ Electrical conduit wireway system
  - — Entrance hubs rated NEMA 4: must be die-cast zinc, PVC, or copper-free die-cast aluminum
- ❑ Mounting hardware for cabinets
- ❑ Control circuit lock-on device to prevent unauthorized power interruption to control power
- ❑ Anti-corrosion compound to apply to ends of wire, if necessary

Call Control-Link Central(TM) operations center at 877/347-3319 to schedule activation of the control system upon completion of the installation. Note: Activation may take up to 1 1/2 hours

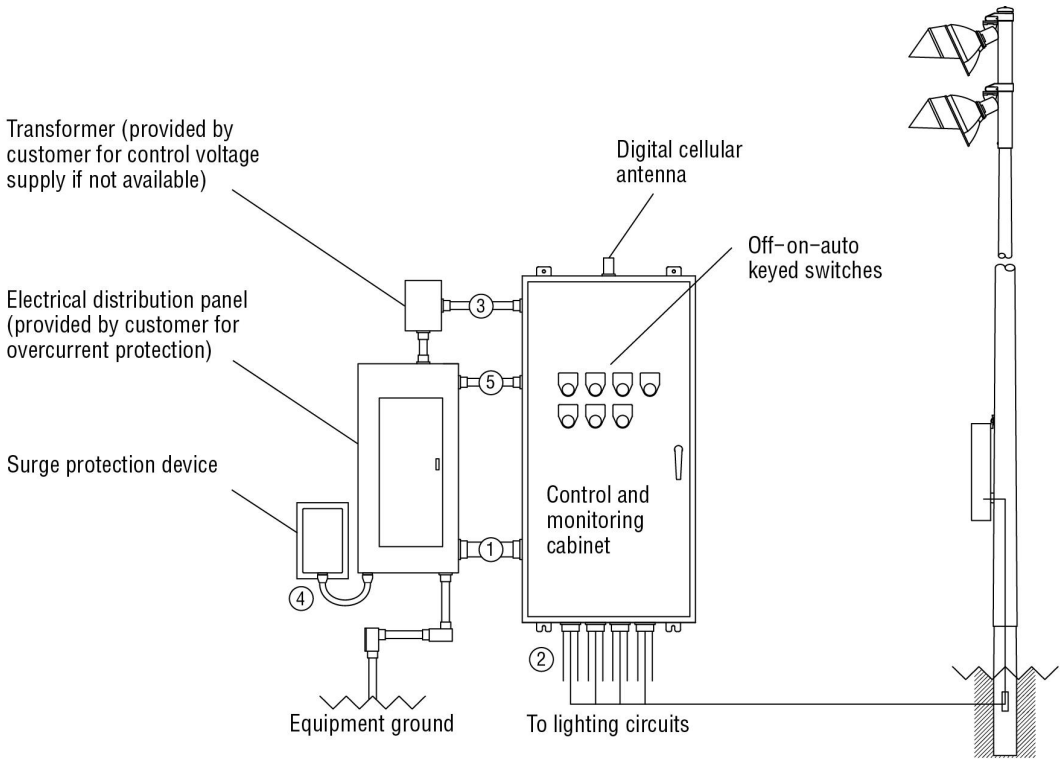
IMPORTANT NOTES

1. Please confirm that the design voltage listed above is accurate for this facility. Design voltage/phase is defined as the voltage/phase being connected and utilized at each lighting pole's ballast enclosure disconnect. Inaccurate design voltage/phase can result in additional costs and delays. Contact your Musco sales representative to confirm this item.
2. In a 3 phase design, all 3 phases are to be run to each pole. When a 3 phase design is used Musco's single phase luminaires come pre-wired to utilize all 3 phases across the entire facility.
3. One contactor is required for each pole. When a pole has multiple circuits, one contactor is required for each circuit. All contactors are UL 100% rated for the published continuous load. All contactors are 3 pole.
4. If the lighting system will be fed from more than one distribution location, additional equipment may be required. Contact your Musco sales representative.
5. A single control circuit must be supplied per control system.
6. Size overcurrent devices using the full load amps column of the Circuit Summary By Zone chart- Minimum power factor is 0.9.

NOTE: Refer to Installation Instructions for more details on equipment information and the installation requirements

Form: T-5030-1

Control•Link® Control and Monitoring System



Wire	Description	# of Wires	Typ. Wire Size (AWG)	Max. Wire Length (FT)	Wire from Musco	Notes
1	Line power to contactors, and equipment grounding conductor	Note A	Note B	27	No	A – E
2	Load power to lighting circuits	Note A	Note B	N/A	No	A – D
3	Control power (dedicated, 20A)	3	12	N/A	No	C, D
4	Surge protection device to distribution panel	– –	– –	N/A	Yes	F
5	Surge protection device monitoring	3	14	N/A	Yes	C, D, F

R60-32-00_B

Notes:
A. Voltage and phasing per the notes on cover page.
B. Calculate per load and voltage drop.
C. All conduit diameters should be per code.
D. Refer to control and monitoring system installation instructions for more details on equipment information and the installation requirements.
E. Contact Musco if maximum wire length from circuit breaker to contactor exceeds value in chart.
F. Refer to surge protection device installation instructions for more details on equipment information and the installation requirements.

IMPORTANT: Control (3) and monitoring (5) wires must be in separate conduit from line and load power wiring (1, 2).

Form: T-5030-1

Control System Summary

SWITCHING SCHEDULE

Field/Zone Description	Zones
Soccer-1	2

CONTROL POWER CONSUMPTION	
120V Single Phase	
VA loading of Musco Supplied Equipment	INRUSH: 1568.0
	SEALED: 194.8

BALLAST SPECIFICATIONS .90 Minimum Power Factor	VOLTAGE: 480v		THREE PHASE				
BALLAST OPERATING VOLTAGE	208	220	240	277	347	380	480
1500 Watt Metal Halide Lamp Operating line amperage per fixture- maximum	8.6	8.3	7.5	6.5	5.1	4.7	3.7
1000 Watt Metal Halide Lamp Operating line amperage per fixture- maximum	6.5	6.4	5.8	4.9	4.0	3.6	2.9

CIRCUIT SUMMARY BY ZONE

POLE	CIRCUIT DESCRIPTION	# OF FIXTURES	FULL LOAD AMPS	CONTACTOR SIZE (AMPS)	CONTACTOR ID	ZONE
S1	Soccer-1	8	22.2	30	C1	2
S2	Soccer-1	8	22.2	30	C2	2
S3	Soccer-1	8	22.2	30	C3	2
S4	Soccer-1	8	22.2	30	C4	2

Form: T-5030-1

Control System Summary

PANEL SUMMARY

CABINET #	CONTROL MODULE LOCATION	CONTACTOR ID	CIRCUIT DESCRIPTION	FULL LOAD AMPS	DISTRIBUTION PANEL ID (BY OTHERS)	CIRCUIT BREAKER POSITION (BY OTHERS)
1	1	C1	Pole S1	22.20		
1	1	C2	Pole S2	22.20		
1	1	C3	Pole S3	22.20		
1	1	C4	Pole S4	22.20		

ZONE SCHEDULE

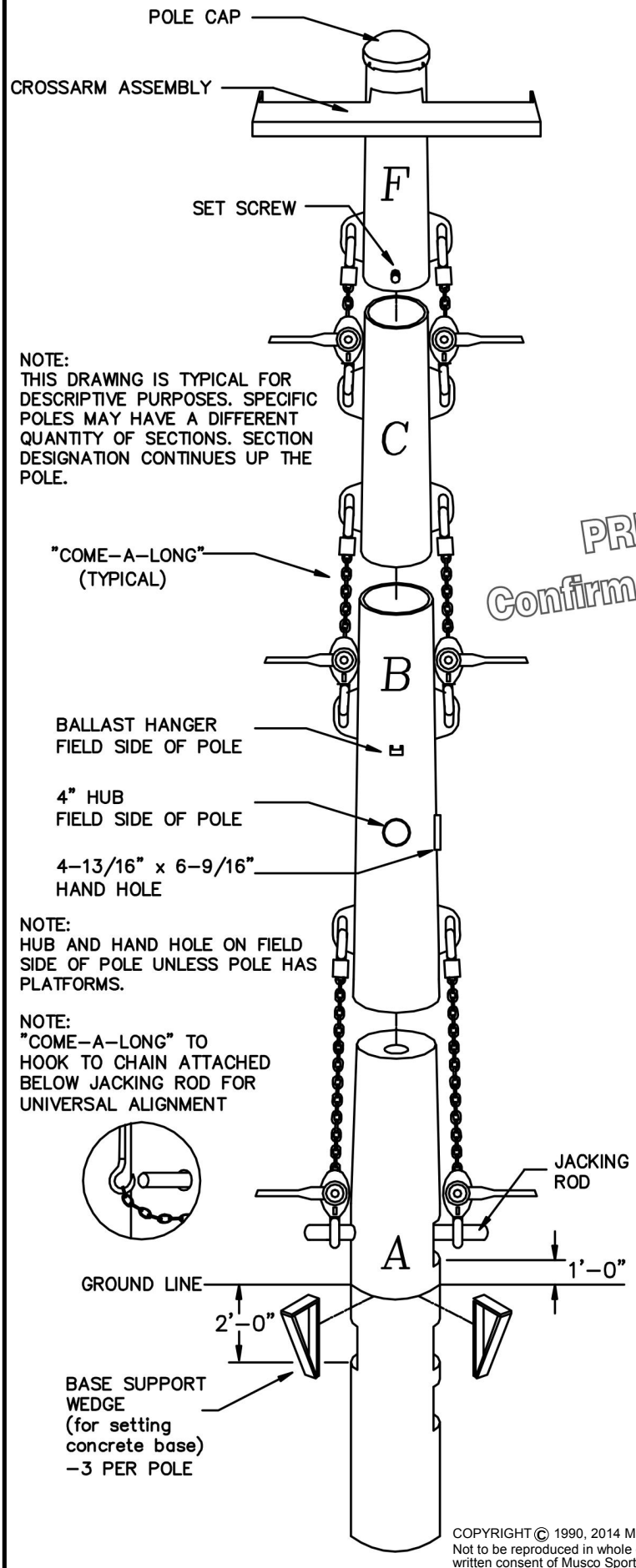
			CIRCUIT DESCRIPTION	
ZONE	SELECTOR SWITCH	ZONE DESCRIPTION	POLE ID	CONTACTOR ID
Zone 2	1	Soccer-1	S1 S2 S3 S4	C1 C2 C3 C4

Foundation and Pole Assembly Drawing

Sheet 1 OF 1

POLE	MTG HT. (ft)	NBR FXT	WEIGHT: CONC BASE (lbs)	WEIGHT: DRESSED POLE (lbs)	BURIAL: HOLE DIA (in)	BURIAL: HOLE DPTH (ft)	BURIAL: BUR DPTH (ft)	BACK FILL (yd^3)
S1	80	8	3810	2459	30	14	14	1.8
S2	100	8	5380	3584	30	16	16	1.8
S3	70	8	2770	1996	30	12	12	1.7
S4	70	8	2770	1996	30	12	12	1.7

Preliminary Information - Foundation requirements should be confirmed prior to installation.



PRELIMINARY
Confirm Before Installing

Note: Design standard FBC wind zone 140 ult (108 asd) mph.

Backfill - concrete needed for backfill is 3000PSI minimum strength.

Foundation design based on UBC or IBC class 5 strength soils.

Refer to Structural foundation designs or jacking drawings for final installation details.

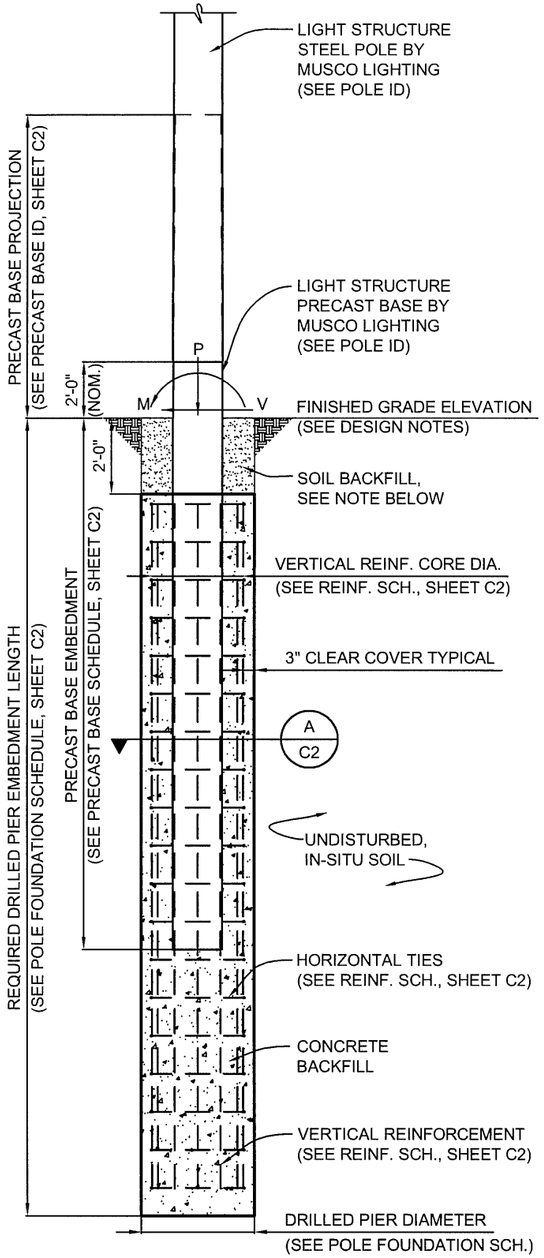
Steel shaft weight is the dressed pole weight.

NOTE:

1: Come-a-longs" not supplied by Musco unless ordered for the Project

Barnett Park Football Phase II
Orlando, FL USA

By:	Scale:	Date: 06/05/2014
Rep: B. DeCouto		Nbr: 168815
Order:		Rev:



FOUNDATION ELEV.

SCALE: NOT TO SCALE

SOIL BACKFILL NOTE:
THE TOP TWO FEET OF ANNULUS MAY BE BACKFILLED WITH SOIL, WITH A CLASSIFICATION OF CLASS 4 (TABLE 1804.2) OR BETTER. COMPACTION, 95% FOR COHESIVE SOIL AND 98% FOR A COHESIONLESS SOIL BASED UPON STANDARD PROCTOR TESTING (ASTM D698).

POLE IDENTIFICATION

POLE DESIGNATION	POLE TYPE	PRECAST BASE TYPE	FIXTURE CONFIGURATION (FIX. PER XARM)	FIXTURE AND ACCESSORIES EPA (FT^2)
S1	LSS80A	4B	8 (4+4)	17.6
S2	LSS100A	5B	8 (4+4)	17.6
S3, S4	LSS70B	3B	8 (4+4)	16.8

CONCRETE/REINFORCEMENT NOTES

CONCRETE SHALL COMPLY WITH THE FOLLOWING ASTM STANDARDS:
MIXTURE WITH ASTM C-94, PORTLAND CEMENT WITH ASTM C-150 TYPE I/II-A, AGGREGATES WITH ASTM C-33 AND BE IN CONFORMANCE WITH ACI 318.

CONCRETE SHALL BE AIR-ENTRAINED (COMPLY WITH ASTM C-260), HAVE A MAXIMUM WATER -CEMENT RATIO, w/cm = 0.43 AND HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF 4,000 PSI.

DESIGN SLUMP LIMITS ARE 4" MINIMUM AND 6" MAXIMUM. THE JOB SITE SLUMP MAY BE INCREASED BY THE USE OF A WATER REDUCING AGENT MEETING ASTM C494-92.

CONCRETE REINFORCEMENT SHALL COMPLY WITH ASTM A615 GRADE 60, EXCEPT TIES CAN BE OF GRADE 40 AND BE IN CONFORMANCE WITH ACI 315 & 318.

CONCRETE DRILLED PIERS MUST ATTAIN 3,000 PSI STRENGTH PRIOR TO POLE INSTALLATION AND FIXTURE MOUNTING.

THE TOP 12'-0" SHOULD BE THOROUGHLY CONSOLIDATED BY MECHANICAL VIBRATION DURING PLACEMENT.

INSTALLATION NOTE:
CONCRETE TO BE PLACED IN A CONTINUOUS POUR OR A COLD JOINT WILL BE ACCEPTABLE AT THE BOTTOM OF THE PRECAST BASE. TWO POUR: WITH THE REINFORCEMENT IN PLACE, THE CONCRETE BELOW THE BOTTOM OF THE PRECAST BASE MAY BE POURED AND ALLOWED TO SET UP FOR APPROXIMATELY FOUR HOURS (CURE LONG ENOUGH TO SUPPORT WEIGHT OF PRECAST BASE). THEN THE PRECAST BASE MAY BE SET IN PLACE AND THE REST OF THE CONCRETE CONCRETE BACKFILL POURED.

DESIGN NOTES

DESIGN PARAMETERS:
WIND: Vult = 140 MPH, Vasd = 108 MPH (EXPOSURE C, RISK CATEGORY II) PER AASHTO STANDARD, 2001 EDITION (I = 1.0; LTS-4); PER FBC, 2010 EDITION; CHAPTER 16, SECTION 1609.1.1, EXCEPTION #7. DESIGN WIND PARAMETERS ARE NOTED. ACTUAL WIND SPEED MUST BE VERIFIED FOR THE SITE BY THE PROPER GOVERNING OFFICIAL.

GEOTECHNICAL PARAMETERS:
ALLOWABLE END BEARING SOIL PRESSURE: 1,650 PSF
ALLOWABLE LATERAL SOIL BEARING PRESSURE: 55 PSF/FT (GRADE TO -4'-0"), 0 PSF/FT (-4'-0" TO -12'-0), 89 PSF/FT (BELOW -12'-0")
IN ACCORDANCE WITH THE 2010 EDITION OF THE FLORIDA BUILDING CODE, CHAPTER 18.

DESIGN SOIL PARAMETERS ARE AS NOTED. ACTUAL ALLOWABLE SOIL PARAMETERS MUST BE VERIFIED ON SITE. REFERENCE SOILS AND FOUNDATION REPORT, NO. 01-06-0081-128A & C09906B031, PREPARED BY NODARSE & ASSOCIATES, INC.; WINTER PARK, FL.

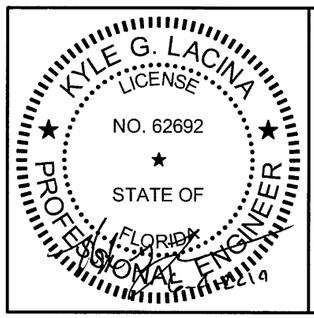
A GEOTECHNICAL ENGINEER OR REPRESENTATIVE OF IS RECOMMENDED (NOT REQUIRED) TO BE AVAILABLE AT THE TIME OF THE FOUNDATION INSTALLATION TO VERIFY THE SOIL DESIGN PARAMETERS AND TO PROVIDE ASSISTANCE IF ANY PROBLEMS ARISE IN FOUNDATION INSTALLATION.

ENCOUNTERING SOIL FORMATIONS THAT WILL REQUIRE SPECIAL DESIGN CONSIDERATIONS OR EXCAVATION PROCEDURES MAY OCCUR. POLE FOUNDATIONS WILL NEED TO BE ANALYZED ACCORDING TO THE SOIL CONDITIONS THAT EXIST. IF ANY DISCREPANCIES OR INCONSISTENCIES ARISE, NOTIFY THE ENGINEER OF SUCH DISCREPANCIES. FOUNDATIONS WILL THEN BE REVISED ACCORDINGLY. REVISIONS WILL BE ANALYZED PER RECOMMENDATIONS DIRECTED BY A LICENSED ENGINEER.

ALL EXCAVATIONS MUST BE FREE OF LOOSE SOIL AND DEBRIS PRIOR TO FOUNDATION INSTALLATION AND CONCRETE BACKFILL PLACEMENT. TEMPORARY CASINGS OR DRILLERS SLURRY MAY BE USED TO STABILIZE THE EXCAVATION DURING INSTALLATION. CASINGS MUST BE REMOVED DURING CONCRETE BACKFILL PLACEMENT. CONCRETE BACKFILL MUST BE PLACED WITH A TREMIE WHEN SLURRY OR WATER IS PRESENT WITHIN THE EXCAVATION OR WHEN THE FREE DROP EXCEEDS 6'-0".

CONTRACTOR MUST BE FAMILIAR WITH THE COMPLETE SOIL INVESTIGATION REPORT AND BORINGS, AND CONTACT THE GEOTECHNICAL FIRM (IF NECESSARY) TO UNDERSTAND THE SOIL CONDITIONS AND THE POSSIBILITY OF GROUND WATER PUMPING AND EXCAVATION STABILIZATION OR BRACING DURING PRECAST BASE INSTALLATION AND PLACEMENT OF CONCRETE BACKFILL.

GENERAL NOTES:
FIXTURES MUST BE LOCATED TO MAINTAIN 10'-0" MINIMUM HORIZONTAL CLEARANCE FROM ANY OBSTRUCTION. ENGINEER MUST BE NOTIFIED IF FOUNDATIONS ARE NEAR ANY RETAINING WALLS OR WITHIN / NEAR ANY SLOPES STEEPER THAN 3H : 1V. POLES, FIXTURES, PRECAST BASES, ELECTRICAL ITEMS AND INSTALLATION PER MUSCO LIGHTING.



I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF FLORIDA.

KYLE G. LACINA - NO. PE 62692
LICENSE RENEWAL DATE: FEBRUARY 28, 2015

STRUCTURAL ENGINEERS, P.C. - NO. 26361

DRAWING NO. COVERED BY THIS SEAL: C1

BARNETT PARK
FOOTBALL PHASE II
FIELD LIGHTING
ORLANDO, FL

musco Lighting
CORPORATE: 100 1ST AVE WEST
OSKALOOSA, IA 52577
(800) 825-6020

STRUCTURAL ENGINEERS, P.C.
114 NICHOLAS DRIVE
MARSHALLTOWN, IOWA 50158
PHONE NUMBER: 641-752-6334
EMAIL: MSL.INFO@SEPC.BIZ

DRAWING TITLE: POLE AND FOUNDATION
SCALE: SEE PLAN
NOTES: SCAN #168815E

PROJECT NUMBER
168815

DATE
4 JUNE 2014

DRAWING NUMBER
C1
OF TWO

PRECAST BASE IDENTIFICATION

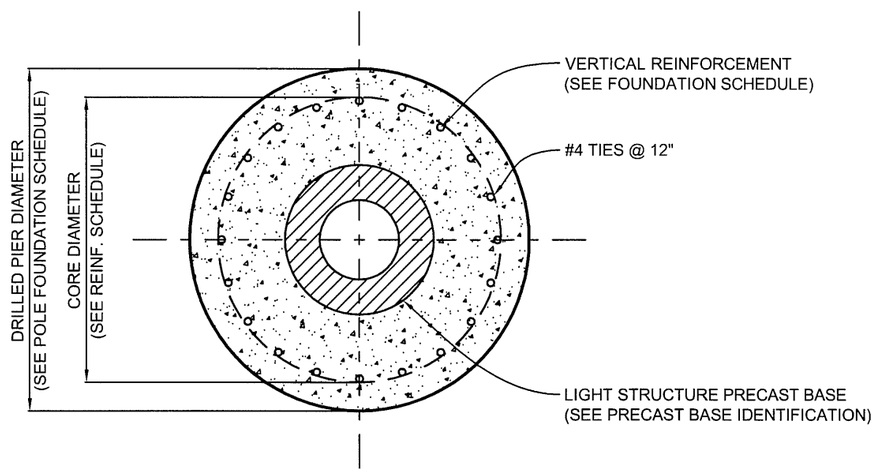
PRECAST BASE TYPE	PRECAST BASE WEIGHT	PRECAST BASE LENGTH	PROJECTION ABOVE GRADE	STANDARD EMBEDMENT	OUTSIDE DIAMETER
3B	2,470 LBS	20'-0"	8'-0"	12'-0"	13.38"
4B	3,490 LBS	22'-0"	8'-0"	14'-0"	15.75"
5B	4,580 LBS	23'-11"	7'-11"	16'-0"	18.25"

REFERENCE POLE ID TABLE ON SHEET C1 FOR POLE TO PRECAST BASE TYPES

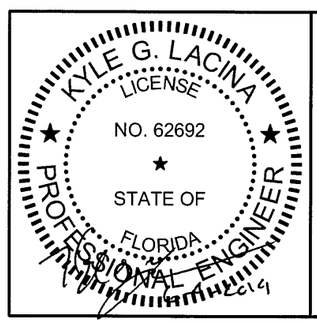
POLE FOUNDATION SCHEDULE

POLE DESIGNATION	FORCES			DRILLED PIER			REINFORCING		
	MOMENT (M) FT-LBS	SHEAR (V) LBS	VERTICAL (P) LBS (1.)	DIAMETER INCHES	EMBEDMENT DEPTH	CONCRETE BACKFILL YD^3 (2.)	CORE DIAMETER INCH (3.)	VERTICAL REINFORCING	HORIZONTAL TIES
S1	108,826	1,855	2,389	36	25'-0"	5.5	29	16 - #6	#4 @ 12"
S2	158,533	2,342	3,494	42	26'-0"	7.7	35	20 - #6	#4 @ 12"
S3, S4	85,876	1,570	1,944	36	24'-0"	5.4	29	16 - #6	#4 @ 12"

1. WEIGHT OF POLE, FIXTURES AND ACCESSORIES.
2. MINIMUM CONCRETE BACKFILL VOLUME, SITE CONDITIONS MAY REQUIRE ADDITIONAL BACKFILL.
3. CORE DIAMETER EQUAL TO INSIDE DIAMETER OF TIES.



A PIER DETAIL
SCALE: NOT TO SCALE



I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF FLORIDA.

KYLE G. LACINA - NO. PE 62692
LICENSE RENEWAL DATE: FEBRUARY 28, 2015

STRUCTURAL ENGINEERS, P.C. - NO. 26361

DRAWING NO. COVERED BY THIS SEAL: C2

BARNETT PARK
FOOTBALL PHASE II
FIELD LIGHTING
ORLANDO, FL

musco Lighting
CORPORATE: 100 1ST AVE WEST
OSKALOOSA, IA 52577
(800) 825-6020

STRUCTURAL ENGINEERS, P.C.
114 NICHOLAS DRIVE
MARSHALLTOWN, IOWA 50158
PHONE NUMBER: 641-752-6334
EMAIL: MSL.INFO@SEPC.BIZ

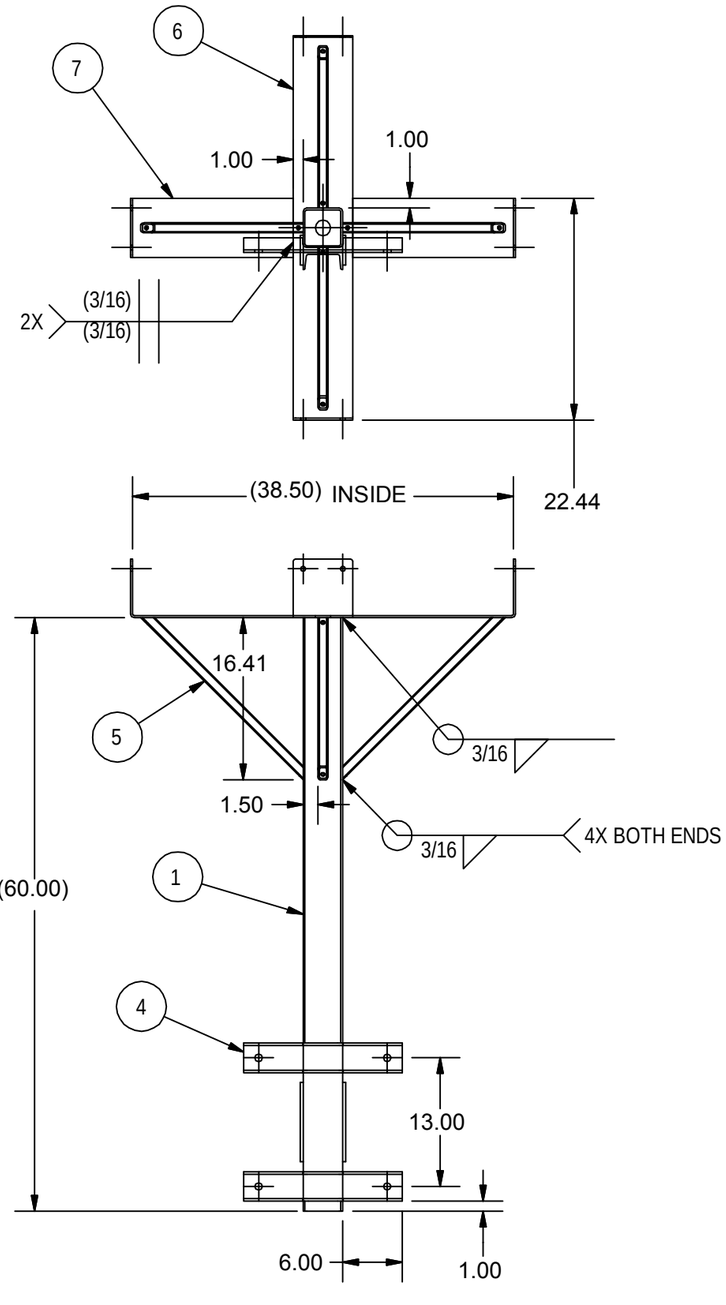
DRAWING TITLE: POLE AND FOUNDATION
SCALE: SEE PLAN
NOTES: SCAN #168815E

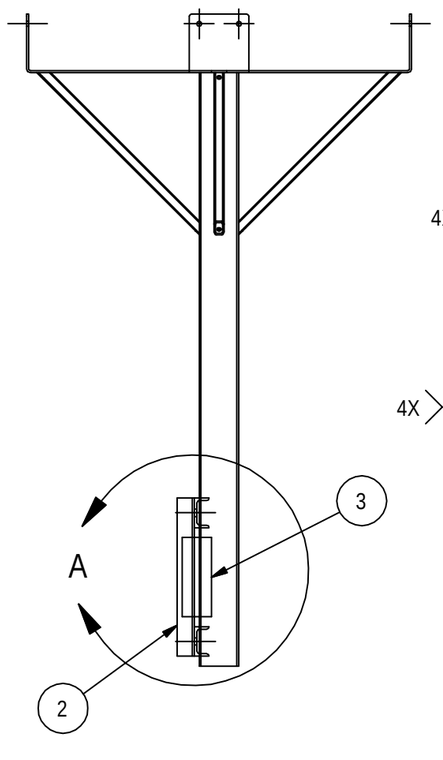
PROJECT NUMBER 168815

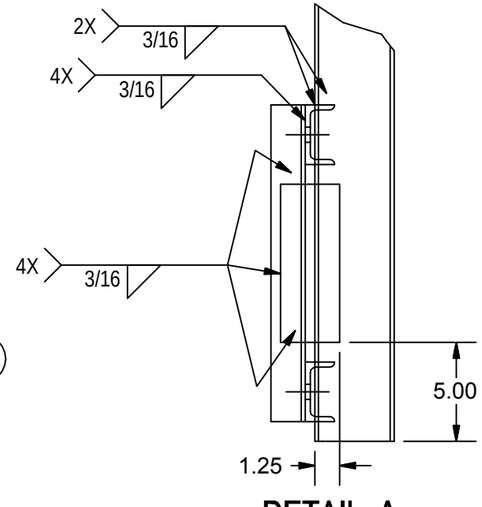
DATE 4 JUNE 2014

DRAWING NUMBER C2
OF TWO

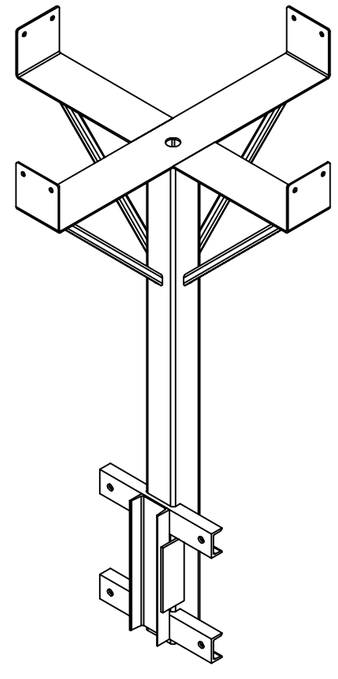
BILL OF MATERIALS PER UNIT			
ITEM	QTY	PART #	DESCRIPTION
1	1		POST TUBE
2	1		SADDLE CHANNEL
3	2		GUSSET
4	2		FOOT CHANNEL
5	4		TUBE BRACE
6	1		LONG DECK STRAP
7	2		SHORT DECK STRAP







DETAIL A
SCALE 1 / 8



Nest to be included on all poles

Weldment

CORPORATE OFFICE:
P.O. Box 808
100 1st Avenue West
Oskaloosa, Iowa 52577
800/825-6020

REVISIONS:	BY: R.L.	DATE:

JOB NUMBER:
DRAWN BY: R.LEEDOM
CHECK BY:
REPRESENTATIVE:
SCALE: 1:16
DATE: 12/19/03
DRAWING NUMBER:
OF SHEETS