SECTION 02100 - SITE PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Related Sections: The following sections contain requirements that relate to this Section:

1. See Section 02200 Earthwork.
2. See Section 02900 Landscape Work.

C. Florida Department Of Transportation
1. Standard Specifications for Road and Bridge Construction 2000 edition.

D. University of Florida
1. The University of Florida Construction Standards, Volume I and II, Current Issue, Section 02010.

1.2 SUMMARY

A. This Section includes the following:

1. Protection of existing trees, vegetation, landscape materials, not scheduled for clearing, which might be damaged by construction activities.
2. Protection of existing site improvements, not scheduled for clearing, which might be damaged by construction activities.
3. Clearing and grubbing of stumps, vegetation, debris, rubbish, designated trees, other vegetation, and site improvements.
4. Temporary erosion control, siltation control, and dust control.
5. Temporary protection of adjacent property, structures, benchmarks, and monuments.
6. Removal and legal disposal of legal materials.
7. Protection of onsite creek and jurisdictional wetlands.

1.3 QUALITY ASSURANCE

A. State and local code requirements shall control the methods used to clear site and procedures for disposal of removed materials.

B. Codes and Standards: Comply with provisions of the following codes, specifications, and standards unless specifically indicated otherwise:

1. Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction 2000 edition, (FDOTSS).

2. University of Florida Construction Standards, Volume I and II, Current Issue, Section 02010.

C. Examine Contract Documents for all work required and coordinate and cooperate with others so as not to delay or interfere with the work of others.

D. Employ a State of Florida licensed surveyor to stake out both horizontal and vertical control for all work prior to commencing any work operations.

1.4 PROJECT 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. Explosives: The use of explosives shall not be permitted.

C. Protection of Existing Improvements and Utilities:

1. Provide protections necessary to prevent damage to existing improvements and utilities indicated to remain in place. Notify Project Engineer immediately of damage to or an encounter with an unknown existing utility line. The Contractor shall be responsible for the repairs of damage to existing utility lines that are indicated or made known to the Contractor prior to start of clearing and grubbing operations. When utility lines, which are to be removed, are encountered within the area of operations, the Contractor shall notify the applicable Utility Company or provider and the Project Engineer in ample time to minimize interruption of the service.
2. Locate existing utilities with assistance of local utility companies and public agencies.
3. Protect improvements on adjoining properties and on Owner's property.
4. Restore damaged improvements to their original condition and grades, as acceptable to property owners.

D. Protection of Existing Trees and Vegetation:

1. Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots and branches, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line.
2. Do not run heavy equipment over tree root systems.
3. Maintain minimum trench widths near root systems so as to avoid unnecessary injury.
4. Protect trees and vegetation designated to remain with temporary barricade or fence enclosures, prior to commencement of site clearing operations. Enclosure shall be a minimum of 8 feet in radius around center of tree trunks, with large trees being protected with fencing set at edge of drip lines. Enclosure of vegetation shall be as

required to prevent damage from construction activities. Maintain fencing throughout construction period, unless otherwise directed.

5. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
6. Provide protection for roots over 1-1/2 inch diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
7. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in a manner acceptable to Project Engineer. Employ a licensed arborist to repair damages to trees and shrubs at no additional cost to Owner.
8. Replace trees which cannot be repaired and restored to full-growth status, as determined by arborist with same species of equivalent size or of species and acceptable size as determined to the Project Engineer. Replacement cost to Contractor will be determined in accordance with the "Tree Evaluation Formula" published in the "Guide to Professional Evaluation of Landscape Trees, Specimen Shrubs and Evergreens" as published by the International Society of Arboriculture.

E. Protection of Existing Creek and Jurisdictional Wetlands

1. Install required silt fence barrier and other required barriers at initial onset of construction. Maintain silt fence and other barriers throughout construction.
2. Do not trespass beyond barriers for any construction activity with the exception of any necessary or required cleanup or mitigation work.
3. Upon completion of construction, remove all silt fencing and other barriers. Clean up any silt, dirt, limerock, or other erosion material, that bypassed silt barriers during construction.
4. Do not disturb any wetland vegetation.

1.5 EXISTING UTILITY INFORMATION

A. Information on the drawings relating to existing utility lines and services is from the best sources presently available. All such information is furnished only for information and is not guaranteed. Excavate test pits as required to determine exact locations of existing utilities.

B. The contractor shall notify all known utility companies and providers to field locate their respective utilities in the vicinity of the project construction area. The contractor shall avoid existing utilities unless necessary to adjust or relocate due to design considerations or construction conflicts.

PART 2 - PRODUCTS

2.1 TREE PROTECTION

A. Commercial grade tree protection material, both fencing and barriers, shall be placed

in accordance with the construction drawings. All tree protection material shall be placed prior to and site clearing, demolition, or construction. Barricades shall be able to withstand bumps by heavy equipment and trucks. Maintain barricades in good condition.

2.2 SILT FENCING

A. Use a geotextile fabric made from woven or nonwoven fabric, meeting the physical requirements of Section 985 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 2000 edition, according to those applications for erosion control. Install all sediment control devices prior to the commencement of any earthwork. Do not attach silt fence to existing trees unless approved by the Engineer.

PART 3 - EXECUTION

3.1 LAYOUT

A. Stake out both horizontal and vertical control for all work prior to commencing work operations. Accurately locate and maintain location of all buildings, roads, paved areas, features, etc. Advise Project Engineer of any Contract Document discrepancies, prior to commencing work.

B. Maintain benchmarks, monuments and other reference points. Re-establish benchmarks if disturbed or destroyed at no cost to Owner.

3.2 SITE CLEARING

A. General:

1. Locate and suitably identify trees and improvements to remain. Remove trees, shrubs, grass and other vegetation, snags, brush, rubbish, rock/boulders, improvements, or obstructions as required to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. "Removal" includes transporting off-site and legally disposing of removed non-salvageable material.
2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner, where such roots and branches obstruct installation of new construction.
3. Trees to remain within cleared areas shall be trimmed of all dead branches 1-1/2 inches or more in diameter. Cut close to bole of tree and paint with acceptable tree-wound paint.

B. Topsoil: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is free of subsoil, clay lumps, stones, and other objects over 1 inch in diameter, and without weeds, roots, and other objectionable material.

1. Strip topsoil in all building areas and all areas to be regraded, resurfaced, or paved within Contract Limit Lines, to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.
2. Stockpile topsoil shall be free of trash, brush, rock/boulders over 1 inch diameter and other extraneous matter.
3. Remove heavy growths of grass from areas before stripping.
4. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.
5. Stockpile topsoil in storage piles in areas indicated, directed or otherwise available. Construct storage piles to provide free drainage of surface water, maximum slope to be 3:1. Cover storage piles, if required, to prevent wind erosion.
6. No topsoil shall be removed from the site, until after all topsoil requirements have been met.
7. Dispose of unsuitable or excess topsoil same as specified for disposal of waste material.

C. Clearing and Grubbing:

1. Clear site of trees, shrubs and other vegetation, except for those indicated to be left standing.
2. Fell trees to be removed in a controlled, safe manner. Trim branches from bole and cut bole into manageable sections.
3. Cut off shrubs and other vegetation, to be removed, flush with original ground surface.
4. Completely remove stumps, roots, and other debris protruding through ground surface and in area(s) of new foundations, or paved improvement.
5. Remove organic and metallic debris to a depth of 3 feet below existing grade to remain or new finished grade whether lower or higher than existing grade.
6. Use only hand methods for grubbing inside drip line of trees indicated to remain. Strip grass materials under tree canopies and carefully till or scarify existing grading to a maximum depth of 1 inch.
7. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
8. Place fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact to a density equal to adjacent original ground.

D. Removal of Improvements:

1. Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.
2. Remove abandoned utility poles with in Contract Limit Lines. Relocate and reinstall designated utility poles, if necessary. Coordinate and cooperate with Division 16 work and local utility company.
3. Abandonment or removal of certain underground pipe or conduits may be indicated on mechanical or electrical drawings, and is included under work of

related Division 15 and 16 sections. Removal of abandoned underground piping or conduit interfering with construction is included under this Section. Record existing utility termination points before disconnecting. Close abandoned piping with 8 inch thick concrete plug(s) or mortar joined masonry bulkhead, or cap off in accordance with utility company or provider standard requirements.

4. Remove existing sidewalks, curbs, and paving, including all base material to subgrade, as required to accommodate new construction, as shown on drawings. Cut existing sidewalks, curbs, and paving in neat, straight lines to provide uniform, even transition from new to adjacent existing work. Cut back existing paving a sufficient distance to permit forming and installation of new work.
5. Remove, temporarily relocate during construction, and reinstall in final location street signs, parking meters, mail boxes, traffic signal control boxes, and other designated items as shown on Drawings. Coordinate the work with applicable governing authorities. Comply with all requirements concerning temporary installation and permanent reinstallation.
6. Raise or lower existing catch basin, inlet and manhole structures and valve box covers to accommodate new grade elevations at paved and lawn areas where indicated on Drawings. Extend structures as required. Reuse existing catch basin, inlet and manhole frames, and covers, unless noted otherwise.
7. Remove existing buildings, structures, walls, concrete pads, enclosures, or other permanent above ground structures. Salvage all material salvageable as appropriate. Dispose of all non-salvageable material offsite in an approved disposal facility in accordance with all local, state, and federal regulations.

3.3 DISPOSAL OF WASTE MATERIALS

A. Burning on Owner's Property: Burning is not permitted on Owner's property.

B. Removal from Owner's Property: Remove waste materials and unsuitable or excess topsoil from Owner's property. Remove to an approved disposal facility in accordance with all local, state, and federal regulations.

3.4 CLEANING

A. Upon completion of site preparation work, clean areas within contract limits, remove tools, and equipment. Provide site clear, clean, and free of materials and debris and suitable for site work operations.

END OF SECTION 02100

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and all provisions of Contract, including General Conditions, Special Provisions and Division-1 Technical Specification sections, apply to work of this section.

B. See Section 02100 for Site Preparation

C. Florida Department Of Transportation
   1. Standard Specifications for Road and Bridge Construction 2000 edition.

1.2 DESCRIPTION OF WORK

A. This Section includes the following:
   1. Excavating and backfilling of foundations within building lines.
   2. Excavating and backfilling of trenches within building lines.
   3. Excavating and backfilling for underground mechanical and electrical utilities and buried mechanical and electrical appurtenances.
   4. Site grading, including final finishing of earthwork areas as indicated on the drawings and includes, but is not limited to constructing, shaping, and finishing site earthwork.

1.3 DEFINITIONS

A. Excavation consists of removal of material to subgrade elevations indicated and subsequent disposal of materials removed.

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

   1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Project Engineer.
   2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Project Engineer.

C. Additional Excavation: When excavation has reached required subgrade elevations, notify Project Engineer, who will make in inspection of conditions. If Project Engineer determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Project Engineer. The Contract Sum may be adjusted by an appropriate Contract Modification.

1. Removal of unsuitable material and its replacement as directed will be paid by Unit Price on basis of Conditions of the Contract relative to changes in work.

D. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular subbase, drainage fill, or topsoil materials.

E. Structure: Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.

1.4 QUALITY ASSURANCE

A. Employ, at Contractor's expense, testing laboratory to perform soil testing and inspection service for quality control testing during earthwork operations.

B. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified.

1. Florida Department of Transportation Standard Specification for Road and Bridge Construction 2000 edition.

1.5 SUBMITTALS

A. Test Reports: Submit the following reports directly to Project Engineer from the testing services, with copy to Contractor:
1. Test reports on borrow material including gradation.
2. Verification of suitability of each footing subgrade material, in accordance with specified requirements.
3. Field reports; in-place soil density tests.
4. One optimum moisture-maximum density curve for each type of soil encountered.
5. Report of actual unconfirmed compressive strength and/or results of bearing tests of each strata tested.

B. Written assurance that the contractor performing trench excavations will comply with all applicable trench safety standards of authorities having jurisdiction.

1.6 JOB CONDITIONS

A. Dig Permit: The Contractor shall obtain a dig permit from Physical Plant Division (PPD) prior to commencing any excavation or grading.

B. Site Information: Data on indicated subsurface conditions are not intended as representations or warranties of accuracy of existing soils conditions. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn therefrom by Contractor. Data are made available for convenience of Contractor.

C. Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner.

D. Existing Utilities

1. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.
2. Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Perform work adjacent to privately owned utilities in accordance with procedures outlined by the utility company. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work as affected by the contract excavation until approval for backfill is granted by the Project Engineer. Report damage to utility lines or subsurface construction immediately to the Project Engineer.
3. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult Project Engineer and utilities companies immediately for directions. Cooperate with Project Engineer and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of Project Engineer.
4. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when permitted in writing by Owner, and then only after acceptable temporary utility services have been provided as required by Owner and other utilities companies.
5. Provide a minimum of 48 hours notice to Project Engineer, and receive written notice to proceed before interrupting any utility.
6. Record any underground utilities observed, encountered or discovered that deviate from the base survey or project drawings. Keep record of any utility adjustments or deviations and provide engineer upon completion of construction for incorporation into project record documents.

E. Use of Explosives: The use of explosives is not permitted.

F. Protection of Persons and Property:
   1. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
   2. Barricade open excavations occurring as part of this work and post with warning lights.

G. Site Information: Data on indicated subsurface conditions are not intended as representations or warranties of accuracy of existing soils conditions. It is expressly understood that the Owner will not be responsible for interpretations or conclusions drawn therefrom by the Contractor. Data are made available for the convenience of the Contractor.

H. Weather limitations: Fill and backfill shall not be constructed when weather conditions detrimentally affect the quality of the finished course. Place fill and backfill only if the atmospheric temperature is above freezing in the shade and is rising. Do not construct fill and backfill in the rain or on saturated subgrades. If weather conditions are windy, hot or arid, with high rate of evaporation, schedule the placement in cooler portions of the day and furnish equipment to add moisture to the fill or backfill during and after placement.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups SM, SW and SP.

B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups SC, ML, MH, CL, CH, OL, OH and PT.

C. Subbase Material: Naturally or artificially graded mixture of natural crushed sand containing not more than (12%) of material passing a #200 sieve.

D. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2 inch sieve and not more than 5 percent passing a No. 4 sieve.

E. Backfill and Fill Materials: Satisfactory soil materials free of clay, rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.

F. General Backfill Adjacent to Structures: Soft, spongy, highly plastic, or otherwise unstable material is prohibited. Material shall be classified as GP, GM, GC, SP, SM, per ASTM D 2487. If more material is required than is available from on-site excavation, then provide that material from approved sources.

G. Borrow: Provide materials meeting requirements for controlled fill and controlled backfill. Obtain borrow materials in excess of those furnished from excavations described herein from sources off site.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavation is unclassified and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

B. Earth Excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as unauthorized excavation.

C. Notify the Project Engineer immediately in writing in the event that it becomes necessary to remove rock, hard material, or other material defined as unsatisfactory to a depth greater than indicated. Refill excavations cut below the depths indicated with controlled fill and compact as specified herein.

D. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F (1 degree C).

3.2 STABILITY OF EXCAVATIONS

A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Provide excavation shoring and bracing where excavations occur adjacent to existing structures to preserve the existing structures without settlement of, or damage to, these existing structures.

C. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

D. Shoring and Bracing: The Contractor shall furnish the material for and do all shoring, bracing, and sheeting necessary to perform and protect the work, excavation and as required to protect adjacent structures, the public, and the Contractor's employees. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

3.3 DEWATERING:

A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

B. Do not allow water to accumulate in excavations. Remove water to prevent soil changes detrimental to stability of subgrades and foundations and to prevent erosion and sedimentation of surrounding areas. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

C. Establish and maintain temporary drainage ditches and other diversions outside excavations to convey rainwater and water removed from excavations to collection or runoff areas. Do not use trench excavations as temporary drainage ditches. Contractor shall be responsible for all dewatering operations and all damage due to flooding, erosion, sedimentation or failure of dewatering operations.

3.4 STORAGE OF EXCAVATED MATERIALS

A. Stockpile satisfactory excavated materials as approved by the Project Engineer until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage in area previously approved by Project Engineer.

B. Locate and retain soil materials away from edge of excavations. Do not store within the dripline of trees indicated to remain.

C. Owner retains the right to all excess topsoil. Contractor to locate at place designated within 5 miles of campus.

D. Dispose of excess excavated soil material and materials not acceptable for use as backfill or fill, in accordance with all applicable regulatory requirements.

3.5 EXCAVATION FOR STRUCTURES

A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete form work, installation of services, and other construction and for inspection.

B. Excavation for footings and foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

C. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot; plus a sufficient distance to permit placing and removal of concrete form work, installation of services, and other construction and for inspection. Do not disturb bottom of excavations, intended for bearing surface.

3.6 EXCAVATION FOR PAVEMENT

A. Excavation for pavement shall conform to FDOT Standard Specification Section 120.

B. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

3.7 TRENCH EXCAVATION FOR PIPES AND CONDUIT

A. Trench excavation, pipe placement, and trench backfill shall comply with the appropriate portions of FDOT Section 430-4 and the sections referenced therein with the exception of Section 430-13.

B. Excavate trenches to uniform width sufficiently wide to provide ample working room and a minimum of 6 to 9 inches of clearance on both sides of pipe or conduit.

C. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

D. Overexcavate soft, weak, or wet excavations as indicated. Use sand placed in 6 inch maximum layers to refill to the proper grade. At the Contractor's option, the excavations may be cut to an over depth of not less than 4 inches and refilled to required grade as specified.

E. For pipes or conduit less than 6 inches in nominal size, and for flat-bottomed, multiple duct conduit units, do not excavate beyond indicated depths. Hand-excavated bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.

F. For pipes and equipment 6 inches or larger in nominal size, shape bottom of trench to fit

bottom pipe for 90 degrees (bottom 1/4 of the circumference). Fill depressions with tamped sand backfill. At each pipe joint, dig bell holes to relieve pipe bell of loads ensure continuous bearing of pipe barrel on bearing surface.

3.8 BACKFILL AND FILL

A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.

B. Under grassed areas, use satisfactory excavated or borrow material.

C. Under walks and pavements, use subbase material, satisfactory excavated or borrow material, or a combination.

D. Under steps, use subbase material.

E. Under building slabs, use subbase material.

F. Under piping and conduit and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation. Shape excavation bottom to fit bottom 90 degrees of cylinder.

G. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and that are carried below bottom of such footings or that pass under the wall footings. Place concrete to level bottom of adjacent footing.

1. Concrete is specified in Division 3.
2. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Project Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.

H. Backfill excavation promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.
2. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.
3. Removal of concrete formwork.
4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
5. Removal of trash and debris from excavation.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

3.9 PLACEMENT AND COMPACTION

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

strip or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

1. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

B. Place backfill and fill materials in layers 6 - 12 inches in loose depth for material compacted by heavy compaction equipment, and not more than six inches in loose depth for material compacted by hand-operated tampers.

C. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

D. Place backfill and fill material evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, conduit to approximately the same elevation in each lift.

E. Backfilling Utility Trenches: Construct backfill in two operations (initial and final) as indicated and specified in this section.

1. Place initial backfill in 6 inch maximum loose lifts to one foot above pipe or conduit unless otherwise specified. Ensure that initially placed material is tamped firmly under pipe haunches. Bring up evenly on each side and along the full length of the pipe, conduit, or structure. Ensure that no damage is done to the utility or its protective coating.
2. Place the remainder of the backfill (final backfill) in 9 inch maximum loose lifts unless otherwise specified. Compact each loose lift as specified in the paragraph entitled "General Compaction" before placing the next lift.
3. Do not backfill in freezing weather or where the material in the trench is already frozen or is muddy, except as authorized.
4. Provide a minimum cover from final grade of 3 feet for water piping and 2 feet for storm and sewer mains.
5. Where settlements greater than the tolerance allowed herein for grading occur in trenches and pits due to improper compaction, excavate to the depth necessary to rectify the problem, then backfill and compact the excavation as specified herein and restore the surface to the required elevation.
6. Coordinate backfilling with testing of utilities. Testing for the following shall be complete before final backfilling: water distribution, sanitary sewer systems.
7. Provide buried warning and identification tape installed in accordance with the manufacturer's recommendation.

F. Control soil and fill compaction providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Project Engineer if soil density tests indicate inadequate compaction.

1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentage of maximum density, in accordance with ASTM D1557:

    a. In overexcavated areas, compact to not less than 95% Modified Proctor maximum dry density (ASTM D-1557).
    b. Under structures (plus a margin of 5 feet beyond building limits) footing bottoms, building slabs and steps, compact for a minimum depth of one foot below exposed surface grade and two feet below footings and slabs on grade to a minimum of 95% of the modified Proctor (ASTM D-1557) maximum dry density.
    c. Paved Areas: Fill placed in areas to be paved shall be compacted to not less than 98% modified Proctor maximum Dry Density (ASTM D1557 Method D).
    d. Under lawn or unpaved areas compact top six inches of subgrade and each layer of backfill or fill material at 85% maximum density.
    e. Under walkways compact top six inches of subgrade and each layer of backfill or fill material at 95% maximum density.
    f. Fill and backfill placed behind retaining walls supporting slabs on grade shall, within 5 feet of the wall, be placed in thin lifts and compacted only with hand operated light-weight compactors to 95% of the Standard Proctor (ASTM D698) Maximum Dry Density. Otherwise, fill and backfill placed behind retaining walls shall be compacted to 90% of the Standard Proctor (ASTM D698) Maximum Dry Density. Heavy equipment shall not be located or operated within 5 feet of retaining walls.

G. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

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

H. Compaction:

    1. Proof Rolling: The bottom of all cleared and stripped areas and the bottom of all excavated areas shall be proof rolled with a large, fully loaded tandem axle dump truck, in the presence of a representative of the testing laboratory, to locate and identify soft spots prior to proof compaction as herein specified. Unsuitable materials in soft areas shall be removed, as approved by the testing laboratory representative, and replaced with suitable fill material as specified herein.
    2. Prior to beginning compaction, in-situ soil moisture contents may need to be controlled in order to facilitate proper compaction. If additional moisture is necessary to achieve compaction objectives, then water should be applied in such a way that it will not cause erosion or removal of the subgrade soils. A moisture content within two percentage points of the optimum indicated by the Modified Proctor test (ASTM D-1557) is recommended.
    3. Proof Compaction:

a. The bottom of all cleared and stripped building areas and the bottom of all excavated building areas, all within the extents as indicated herein, shall be densified by rolling with an 8 to 10 ton vibratory roller. At least ten overlapping passes should be made over the site, with the successive passes aligned perpendicular. Within the building areas, compaction should continue until a minimum density of 95 percent of the Modified Proctor maximum dry density (ASTM D-1557) is developed for a minimum depth of two foot below the footing bottom elevation(s) as determined by field density (compaction) tests. Within roadways and parking areas, the natural in-place soils also need to be compacted to a dry density of at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557) as tested to a depth of one foot below the stripped subgrade.
b. Rutting or pumping shall indicate unsatisfactory material and that material shall be undercut as directed by the Project Engineer, to a depth of 12 inches, and replaced with the appropriate fill material.
c. Perform proof rolling only when weather conditions permit. Do not proof roll wet or saturated subgrades. Materials degraded by proof rolling a wet or saturated subgrade shall be replaced by the Contractor as directed by Project Engineer at no cost to the Project Engineer.
d. Notify the Architect, Owner, and Project Engineer 3 days prior to proof rolling.
e. The contractor shall exercise care to avoid transmission of vibrations that could cause settlement damage or disturb occupants of nearby existing structures. Proof compaction within 25 feet of existing structures, or farther away as warranted to avoid transmission of vibrations as noted herein, shall be accomplished with a fully loaded 2 cubic yard capacity rubber tired front end loader. Any compaction effort that is anticipated to cause vibrations that may affect adjacent structures or occupants shall not be performed unless prior notification is provided to the owner and approval for compaction activity proposed is granted by the owner.

4. Control soil compaction during construction providing minimum percentages of maximum densities specified for each area classification as specified herein.
5. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations.

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

   a. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry as directed by the Project Engineer. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

8. Use hand-operated, plate-type, vibratory, or other suitable hand tampers in areas not accessible to larger rollers or compactors. Avoid damaging pipes and protective pipe coatings. Compact material in accordance with the following unless otherwise specified. If necessary, alter, change, or modify selected equipment or compaction methods to meet specified compaction requirements.

3.10 GRADING

A. Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated on the plans, or between points where elevations are indicated on the plans, or between such points and existing grades. Slopes shall be graded no steeper than 6 horizontal to 1 vertical, unless otherwise indicated on the drawings.

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

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above and below required subgrade elevations.
2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.
3. Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 1/2" above or below required subgrade elevation.

C. Grading Surface of Fill Under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2" when tested with a 10" straightedge.

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

3.11 PREPARATION FOR TOPSOIL

A. Clear areas indicated or specified to receive topsoil of materials interfering with planting and maintenance operations. Do not place topsoil when subgrade is frozen, extremely wet or dry, or in other conditions detrimental to seeding, planting, or grading. Spread topsoil to a uniform depth of 4 inches over the designated area.

B. Spreading Topsoil: Clear areas to receive topsoil for the finished surface of materials that would interfere with planting and maintenance operations. Scarify subgrade to a depth of 2 inches. Do not place topsoil when the subgrade is frozen, extremely wet or dry, or in other conditions detrimental to seeding, planting, or grading.

3.12 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

B. Perform field density tests in accordance with ASTM D1556 (sand cone method) or ASTM D2167 (rubber balloon method), as applicable.

1. Field density tests may also be performed by the nuclear method in accordance with ASTM D2922, providing that calibration curves are periodically checked and adjusted to

correlate to tests performed using ASTM D1556. In conjunction with each density calibration check, check the calibration curves furnished with the moisture gauges in accordance with ASTM D3017.

2. If field tests are performed using nuclear methods, make calibration checks of both density and moisture gauges at the beginning of work, on each different type of material encountered, and at intervals as directed by the Project Engineer.

C. Footing Subgrade: For each strata of soil on which footings will be placed, perform at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata when acceptable to Project Engineer. Contractor will verify the minimum separation between bottom of footings and Strata 2 and 3 soils have been met.

D. Paved Areas and Building Slab Subgrade: Perform at least one field test of subgrade for every 5,000 square feet of paved area or building slab, but in no case fewer than three tests.

1. In each compacted fill layer, perform one field density test for every 5,000 square feet of overlaying building slab or paved area, but in no case fewer than three tests.
2. Foundation Wall Backfill: Perform at least two field density tests at locations and elevations as directed.
3. If in opinion of Project Engineer based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, perform additional compaction and testing until specified density is obtained.

E. In pavement subgrade areas and landscaped areas the field density testing interval shall be every 7,500 square feet, with at least one test performed in non-contiguous areas.

F. In backfill for pipes, the field density testing interval shall be every 100 feet on alternating sides of the pipe.

3.13 MAINTENANCE:

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

D. Settling: Where settling is measurable or observable at excavated areas before project completion, remove surface, add backfill material, compact and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.14 DISPOSAL OF EXCESS AND WASTE MATERIALS:

A. Remove trash, debris, and waste materials and dispose of them off Owner's property.

Stockpile excess excavated material as directed by Project Engineer.

B. Dispose of excavated material in such a manner that it will not obstruct the flow of runoff, streams, endanger a partly finished structure, impair the efficiency or appearance of facilities, or be detrimental to the completed work.

END OF SECTION 02200

SECTION 02230 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Related Sections: The following sections contain requirements that relate to this Section:

1. See Section 02310 "Grading"
2. See Section 02315 “Excavation and Fill”
3. See Section 02335 “Subgrade and Roadbed”
4. See Section 02930 “Trees, Plants, and Groundcover”

1.2 SUMMARY

A. This Section includes the following:

1. Protection of existing trees to remain.
2. Protection of existing utilities to remain.
3. Removal of trees and other vegetation.
5. Topsoil stripping and stockpiling.
6. Clearing and grubbing.
7. Removing above-grade improvements as indicated on drawings.
8. Removing below-grade improvements as indicated on drawings or as determined by Project Engineer.

1.3 QUALITY ASSURANCE

A. State and local code requirements shall control the methods used to clear site and procedures for disposal of removed materials.

B. Codes and Standards: Comply with provisions of the following codes, specifications, and standards unless specifically indicated otherwise:

1. Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction 2000 edition, (FDOTSS).

C. Examine Contract Documents for all work required and coordinate and cooperate with

others so as not to delay or interfere with the work of others.

D. Employ a State of Florida licensed surveyor to stake out both horizontal and vertical control for all work prior to commencing any work operations.

1.4 PROJECT 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. Explosives: The use of explosives shall not be permitted.

C. Protection of Existing Improvements and Utilities:

1. Provide protections necessary to prevent damage to existing improvements and utilities indicated to remain in place. Notify Project Engineer immediately of damage to or an encounter with an unknown existing utility line. The Contractor shall be responsible for the repairs of damage to existing utility lines that are indicated or made known to the Contractor prior to start of clearing and grubbing operations. When utility lines, which are to be removed, are encountered within the area of operations, the Contractor shall notify the applicable Utility Company or provider and the Project Engineer in ample time to minimize interruption of the service.
2. Locate existing utilities with assistance of local utility companies and public agencies.
3. Protect improvements on adjoining properties and on Owner's property.
4. Restore damaged improvements to their original condition and grades, as acceptable to property owners.

D. Protection of Existing Trees and Vegetation:

1. Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots and branches, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line.
2. Do not run heavy equipment over tree root systems.
3. Maintain minimum trench widths near root systems so as to avoid unnecessary injury.
4. Protect trees and vegetation designated to remain with temporary barricade or

fence enclosures, prior to commencement of site clearing operations. Enclosure shall be a minimum of 8 feet in radius around center of tree trunks, with large trees being protected with fencing set at edge of drip lines. Enclosure of vegetation shall be as required to prevent damage from construction activities. Maintain fencing throughout construction period, unless otherwise directed.

5. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
6. Provide protection for roots over 1-1/2 inch diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
7. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in a manner acceptable to Project Engineer. Employ a licensed arborist to repair damages to trees and shrubs at no additional cost to Owner.
8. Replace trees which cannot be repaired and restored to full-growth status, as determined by arborist with same species of equivalent size or of species and acceptable size as determined to the Project Engineer. Replacement cost to Contractor will be determined in accordance with the "Tree Evaluation Formula" published in the "Guide to Professional Evaluation of Landscape Trees, Specimen Shrubs and Evergreens" as published by the International Society of Arboriculture.

1.5 EXISTING UTILITY INFORMATION

A. Information on the drawings relating to existing utility lines and services is from the best sources presently available. All such information is furnished only for information and is not guaranteed. Excavate test pits as required to determine exact locations of existing utilities.

B. The contractor shall notify all known utility companies and providers to field locate their respective utilities in the vicinity of the project construction area. The contractor shall avoid existing utilities unless necessary to adjust or relocate due to design considerations or construction conflicts.

PART 2 - PRODUCTS

Not applicable to this Section.

PART 3 - EXECUTION

3.1 LAYOUT

A. Stake out both horizontal and vertical control for all work prior to commencing work operations. Accurately locate and maintain location of all buildings, roads, paved areas, features, etc. Advise Project Engineer of any Contract Document discrepancies, prior to commencing work.

B. Maintain benchmarks, monuments and other reference points. Re-establish benchmarks if disturbed or destroyed at no cost to Owner.

3.2 SITE CLEARING

A. General:

1. Locate and suitably identify trees and improvements to remain. Remove trees, shrubs, grass and other vegetation, snags, brush, rubbish, rock/boulders, improvements, or obstructions as required to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. "Removal" includes transporting off-site and legally disposing of removed non-salvageable material.
2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner, where such roots and branches obstruct installation of new construction.
3. Trees to remain within cleared areas shall be trimmed of all dead branches 1-1/2 inches or more in diameter. Cut close to bole of tree and paint with acceptable tree-wound paint.

A. Topsoil: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is free of subsoil, clay lumps, stones, and other objects over 1 inch in diameter, and without weeds, roots, and other objectionable material.

1. Strip topsoil in all building areas and all areas to be regraded, resurfaced, or paved within Contract Limit Lines, to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.
2. Stockpile topsoil shall be free of trash, brush, rock/boulders over 1 inch diameter and other extraneous matter.
3. Remove heavy growths of grass from areas before stripping.
4. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.
5. Stockpile topsoil in storage piles in areas indicated, directed or otherwise available. Construct storage piles to provide free drainage of surface water, maximum slope

to be 3:1. Cover storage piles, if required, to prevent wind erosion.
6. No topsoil shall be removed from the site, until after all topsoil requirements have been met.
7. Dispose of unsuitable or excess topsoil same as specified for disposal of waste material.

B. Clearing and Grubbing:

1. Clear site of trees, shrubs and other vegetation, except for those indicated to be left standing.
2. Fell trees to be removed in a controlled, safe manner. Trim branches from bole and cut bole into manageable sections.
3. Cut off shrubs and other vegetation, to be removed, flush with original ground surface.
4. Completely remove stumps, roots, and other debris protruding through ground surface and in area(s) of new foundations, or paved improvement.
5. Remove organic and metallic debris to a depth of 3 feet below existing grade to remain or new finished grade whether lower or higher than existing grade.
6. Use only hand methods for grubbing inside drip line of trees indicated to remain. Strip grass materials under tree canopies and carefully till or scarify existing grading to a maximum depth of 1 inch.
7. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
8. Place fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact to a density equal to adjacent original ground.

C. Removal of Improvements:

1. Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.
2. Remove abandoned utility poles with in Contract Limit Lines. Relocate and reinstall designated utility poles, if necessary. Coordinate and cooperate with Division 16 work and local utility company.
3. Abandonment or removal of certain underground pipe or conduits may be indicated on mechanical or electrical drawings, and is included under work of related Division 15 and 16 sections. Removal of abandoned underground piping or conduit interfering with construction is included under this Section. Record existing utility termination points before disconnecting. Close abandoned piping with 8 inch thick concrete plug(s) or mortar joined masonry bulkhead, or cap off in accordance with utility company or provider standard requirements.
4. Remove existing sidewalks, curbs, and paving, including all base material to

subgrade, as required to accommodate new construction, as shown on drawings. Cut existing sidewalks, curbs, and paving in neat, straight lines to provide uniform, even transition from new to adjacent existing work. Cut back existing paving a sufficient distance to permit forming and installation of new work.

5. Remove, temporarily relocate during construction, and reinstall in final location street signs, parking meters, mail boxes, traffic signal control boxes, and other designated items as shown on Drawings. Coordinate the work with applicable governing authorities. Comply with all requirements concerning temporary installation and permanent reinstallation.
6. Raise or lower existing catch basin, inlet and manhole structures and valve box covers to accommodate new grade elevations at paved and lawn areas where indicated on Drawings. Extend structures as required. Reuse existing catch basin, inlet and manhole frames, and covers, unless noted otherwise.
7. Remove existing buildings, structures, walls, concrete pads, enclosures, or other permanent above ground structures. Salvage all material salvageable as appropriate. Dispose of all non-salvageable material offsite in an approved disposal facility in accordance with all local, state, and federal regulations.

3.3 DISPOSAL OF WASTE MATERIALS

A. Burning on Owner's Property: Burning is not permitted on Owner's property.

B. Removal from Owner's Property: Remove waste materials and unsuitable or excess topsoil from Owner's property. Remove to an approved disposal facility in accordance with all local, state, and federal regulations.

3.4 CLEANING

A. Upon completion of site preparation work, clean areas within contract limits, remove tools, and equipment. Provide site clear, clean, and free of materials and debris and suitable for site work operations.

END OF SECTION 02230

SECTION 02361 - TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following for termite control:

1. Soil treatment.

B. The University will provide soil treatment to the General Contractor at no charge; the payment for this service shall be directly from the project funds to the University's Environmental Health and Safety Division (EH&S). The Contractor shall coordinate with EH&S's Pest Control Unit, and request this service at least 48 hours in advance by calling 352-392-1904 or 352-392-2365.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements: Formulate and apply termiticides, and label with a Federal registration number, to comply with EPA regulations and authorities having jurisdiction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

1.3 APPLICATION, GENERAL

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

B. Soil treatment shall be required under all footings, slabs on grade, and sidewalks that adjoin new or existing buildings. Soil treatment shall not be applied until excavating, filling, compacting, and grading operations are complete.

C. The Contractor shall exercise caution to prevent disturbance of the treated area. If any area is required to be re-treated, through no fault of the Owner or Architect, it will be done at the Contractor's expense.

END OF SECTION 02361

SECTION 02511 – HOT-MIXED ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Related Work Specified Elsewhere

1. See Section 02200 for Earthwork.
2. See Section 02520 for Portland Cement Concrete Paving.
3. See Section 02530 for Sanitary Sewage Systems.
4. See Section 02630 for Storm Drainage.

C. 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.

1. Florida Department of Transportation. Standard Specifications for Road and Bridge Construction 2000 edition.

1.2 DESCRIPTION OF WORK

A. Construction of limerock base course is included in this section.

B. Furnish all labor, material and equipment necessary to complete all placement of limerock base course and related work as shown and/or specified herein.

C. Extent of asphalt concrete paving work is shown on Drawings.

D. Asphaltic Concrete paving including FDOT Type S is included in this section.

E. Prepared aggregate sub-base is specified in earthwork sections.

F. Saw-cutting of edges of existing pavement is specified in site preparation section.

G. Furnish all labor, material and equipment necessary to complete all paving and related work as shown and/or specified herein.

1.3 SUBMITTALS

A. Certificates: Provide copies of current FDOT approvals of sources for the limerock material for base course, and current FDOT approvals for compliance with the specified requirements.

B. Job-mix formula: Prior to production of any asphaltic paving mixture, the Contractor shall

submit a mix design to the Project Engineer at least two weeks before the scheduled start of production. The information furnished shall be as described in Section 331 of the FDOT Standard Specifications.

C. Material Certificates: Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements for the following materials:

1. Bituminous material, coarse and fine aggregate and mineral filler for asphalt concrete.

D. Asphaltic Concrete Mix Plant Certificate: Provide copy of FDOT approval of Asphaltic concrete mix plant for compliance with the specified requirements.

E. Test Reports: Submit reports to Project Engineer for all tests as herein specified, to include surface materials.

1. Specific gravity test of asphalt
2. Coarse aggregate tests
3. Weight of slag test
4. Percent of crushed pieces in gravel
5. Fine aggregate tests
6. Specific gravity of mineral filler
7. Bituminous mixture tests

F. Field Test Reports

1. Aggregates tests
2. Bituminous mix tests
3. Pavement courses

1.4 QUALITY ASSURANCE

A. Codes and Standards:

1. Comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 2000 edition and with local governing regulations if more stringent than herein specified.
2. The University of Florida Construction Standards.

B. Provide material furnished by a bulk asphaltic concrete producer regularly engaged in the production of hot-mix, hot-laid asphaltic concrete paving materials.

C. Materials and installed work may require testing and retesting, as directed by Project Engineer, at any time during progress of work. Allow free access to material stockpiles and facilities. Tests, including retesting of rejected materials and installed work, shall be done at Contractor’s expense.

D. Testing: All testing shall be performed by a qualified testing lab under the direction of a

professional engineer registered in the State of Florida. Test results shall be submitted to the Project Engineer for review. The Contractor shall bear all testing expenses.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver manufactured products in manufacturer's original, unopened, and undamaged containers with labels intact and legible.

B. Store and handle manufactured products to prevent damage and deterioration.

C. Inspect materials delivered to the site for damage and store with a minimum of handling. Store aggregates in such a manner as to prevent segregation, contamination, or intermixing of the different aggregate sizes.

1.6 SITE CONDITIONS

A. Construct asphalt concrete surface course when atmospheric temperature is above 40 degrees F (4 degrees C) and when base is dry.

B. Grade Control: Establish and maintain required lines and elevations, including crown, inverted crown, and cross-slopes, for each course during paving operations.

C. Provide temporary barricades and warning lights as required for protection of project work and public safety.

D. Protect adjacent work from damage, soiling and staining during paving operations.

1.7 EQUIPMENT

A. Paving Equipment: Spreading, self-propelled asphalt paving machines capable of maintaining line, grade and thickness shown.

B. Compacting equipment: Self-propelled rollers, minimum 10 ton weight.

C. Hand tools: Rakes, shovels, tampers, and other miscellaneous equipment required to complete the work.

1. Hand Tampers: Minimum weight of 25 pounds with a tamping face of not more than 50 square inches.
2. Mechanical Hand Tampers: Commercial type, operated by pneumatic pressure or by internal combustion.

1.8 COORDINATION:

A. Examine Drawings and Specifications for all Contracts, to determine nature of proposed construction. Perform work to conform to construction called for in such a manner as not to interfere or delay work of other Contractors.

PART 2 - PRODUCTS

2.1 GENERAL

A. Use locally available, State Department of Transportation approved materials and gradations which exhibit a satisfactory record of previous installations.

B. Limerock Material: Limerock material for limerock base course shall be supplied from an FDOT approved source and shall conform to the requirements of FDOT Section 911

2.2 LIMEROCK BASE

A. Limerock base shall be constructed in accordance with the requirements of FDOT Section 200 with the exception of Section 200-5.3, 200-6.3, 200-6.4, 200-9.1, 200-9.3, 200-10, 200-11, 200-12.

B. The limerock base course shall be compacted to a minimum density of 98% Modified Proctor Maximum Dry Density (ASTM D1557 Method D). The Modified Proctor Maximum Dry Density shall be based on limerock material specimens obtained on this specific project site. Non project specific Proctor tests shall not be used.

C. Place base material on dry subgrade in lifts from minimum 6" to maximum 12". Remove all subgrade material churned or mixed with foundation course and replace as necessary at Contractor's expense.

D. Grades for base course shall be +/- .25" of required grades.

E. Remove loose and foreign material from compacted foundation course immediately before application of surface materials.

2.3 HERBICIDE TREATMENT

A. Use commercially available chemical for weed control, registered by Environmental Protection Agency. Provide granular, liquid or wettable powder form, labeled for use under asphaltic concrete pavement surfaces. Material shall not damage trees and plants adjacent to pavement surfaces.

B. 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. Allied Chemical Corp.
2. Achem Products, Inc.
3. Ciba-Geigy Corp.
4. Dow Chemical U.S.A.
5. E.I. DuPont De Nemours & Co., Inc.
6. FMC Corp.

7. Thompson-Hayward Chemical Co.
8. U.S. Borax and Chemical Corp.

2.3 AGGREGATES

A. Grade and proportion aggregates and filler so that combined mineral aggregate conforms to specified grading.

B. Course aggregate shall be supplied from FDOT approved sources and shall conform to the requirements of FDOT Section 901 and the referenced provisions of Section 331 for aggregates to be used in asphaltic concrete.

C. Fine aggregate shall be supplied from FDOT approved sources and shall conform to the requirements of FDOT Section 902 and the referenced provisions of Section 331 for fine aggregates to be used in asphaltic concrete.

D. Mineral filler shall conform to the requirements of FDOT Section 917 and the referenced provisions of Section 331.

2.4 ASPHALTIC CONCRETE:

A. General: Asphaltic Concrete shall be Type S-I and Type S-III as indicated on the plans.

B. Type S-I Asphaltic Concrete: Type S-I asphaltic concrete shall conform with the requirements of FDOT Section 331 and the Sections referenced therein with the exception of references to acceptance of work on a lot by lot basis in Section 331-1 and references to reclaimed asphalt pavement in Section 331-4 and with the exception of Sections 331-6.1, 331-6.3 and 331-7 and other references to payment as detailed below.

C. Type S-III Asphaltic Concrete: Type S-III asphaltic concrete shall conform with the requirements of FDOT Section 333 and the Sections referenced therein with the exception of references to acceptance of work on a lot by lot basis in Section 333-1 and payment and references to reclaimed asphalt pavement in Section 331-4 and with the exception of Sections 333-1, 333-6.2 and other references to payment as detailed below.

D. Bituminous material shall conform to FDOT Section 916-1 for Asphalt Cement Viscosity Grade AC-20 or AC-30 with the exception that material failing to meet the viscosity requirements will be rejected.

PART 3 - EXECUTION

3.1 PREPARATION

A. Refer to FDOT Standard Specifications Section 330-8.

3.2 PLACING MIX

A. Refer to FDOT Standard Specifications Section 330-9.

3.3 COMPACTING MIXTURE

A. Refer to FDOT Standard Specifications Section 330-10, with the exception of 330-10.3.3 and 330-10.3.4

3.4 JOINTS.

A. Refer to FDOT Standard Specifications Section 330-11.

3.5 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect, test and approve limerock base before further construction work is performed as indicated herein.

B. Testing:

1. The limerock base shall be tested for field density with one test taken every 7,500 square feet or portion thereof at locations designated by the Project Engineer.
2. Field density checks shall be performed by either the Sand Cone Method ASTM D 1556 or the Nuclear Density Method ASTM D 2922.
3. As required by the Project Engineer, the asphaltic concrete finished surface shall be checked for irregularities according to FDOT Section 330-12.3 with the exception of references to payments or pay quantities. As required by the Project Engineer, the pavement thickness shall be checked in accordance with FDOT Section 330-14 and 330-15 with the exception of references to payments or pay quantities.
4. At the option of the Project Engineer, stability of asphaltic concrete determined according to ASTM D1559, extraction tests for asphaltic concrete according to ASTM D1856 or ASTM D2172, and in-place density tests of pavement according to ASTM D2950 shall be performed.

C. If in the opinion of the Project Engineer, based on testing service reports and inspection, for asphaltic concrete surface course, which have been placed and do not meet specified requirements, provide corrections and additional testing at no additional expense.

3.6 PROTECTION

A. Refer to FDOT Standard Specifications Section 330-13 for protection of finished surface.

3.7 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work.

Remove from site all excess materials, debris, and equipment. Repair damage resulting from paving operations.

B. Sweep pavement and wash free of stains, discolorations, dirt, and other foreign material immediately prior to final acceptance.

END OF SECTION 02511

SECTION 02515 – UNIT PAVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Related Work Specified Elsewhere

1. See Section 02200 for Earthwork.
2. See Section 02511 for Hot-Mixed Asphalt Paving.
3. See Section 02520 for Portland Cement Concrete Paving.
4. See Section 02530 for Sanitary Sewage Systems.
5. See Section 02630 for Storm Drainage.

C. 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.

1. Florida Department of Transportation. Standard Specifications for Road and Bridge Construction 2000 edition.

1.2 DESCRIPTION OF WORK

A. Construction of exterior brick pavers over a prepared setting bed is included in this section.

B. Furnish all labor, material and equipment necessary to complete all placement of pavers and related work as shown and/or specified herein.

C. Extent of brick paver work is shown on Drawings.

D. Prepared base is specified in earthwork sections.

E. Furnish all labor, material and equipment necessary to complete all paver and related work as shown and/or specified herein.

1.3 QUALITY ASSURANCE

A. Construction Tolerance: Unit-to-unit offset tolerance of 1/32 inch from flush an d 1/8 inch in 10 feet from level or required slope.

B. Construction Tolerance: Unit-to-unit offset tolerance of 1/16 inch from flush, 1/8 inch in 2 feet and 1/4 in 10 feet from level or required slope

C. Comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 2000 edition and with local governing regulations if more stringent than herein specified and the University of Florida Construction Standards.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver manufactured products in manufacturer's original, unopened, and undamaged containers with labels intact and legible.

B. Store and handle manufactured products to prevent damage and deterioration.

C. Inspect materials delivered to the site for damage and store with a minimum of handling.

1.6 SITE CONDITIONS

A. Construct brick paver surface course when base is dry.

B. Grade Control: Establish and maintain required lines and elevations, including crown, inverted crown, and cross-slopes, for each course during paving operations.

C. Provide temporary barricades and warning lights as required for protection of project work and public safety.

D. Protect adjacent work from damage, soiling and staining during paving operations.

1.7 EQUIPMENT

A. Compacting equipment: Vibratory compactor.

B. Hand tools: Rakes, shovels, tampers, and other miscellaneous equipment required to complete the work.

1. Hand Tampers: Minimum weight of 25 pounds with a tamping face of not more than 50 square inches.
2. Mechanical Hand Tampers: Commercial type, operated by pneumatic pressure or by internal combustion.

1.8 COORDINATION:

A. Examine Drawings and Specifications for all Contracts, to determine nature of proposed construction. Perform work to conform to construction called for in such a manner as not to interfere or delay work of other Contractors.

PART 2 - PRODUCTS

2.1 GENERAL

A. Brick Pavers:

1. Class: ASTM C902, Weather Class SX for use subject to freezing application
2. Traffic Type: ASTM C 902, Traffic Type II for exterior commercial walkways use.
3. Application: ASTM C 902, Application Type PS for general use application

B. Mortar and Grout:

1. Mortar: Portland cement and lime setting-bed mortar, ASTM C 270, Type M.
2. Bond Coat: Latex-modified Portland cement slurry.
3. Grout: Latex-modified Portland cement grout.
4. Integral Color: Pigment additive.

C. Edge Restraints: Commercial steel edging with loops for support stakes.

D. Setting Bed: Ungrouted mortarless setting bed over filter fabric and stone dust bed and prepared sub-base.

E. Joint Treatment: Hand-tight joints with sand filler.

PART 3 - EXECUTION

3.1 PREPARATION

A. Base to be placed in accordance with Section 02520 contained herein.

3.2 PLACING PAVERS

A. Setting base to be placed within specified tolerances.

B. Unit pavers to be placed within specified tolerances and set in a pattern as described by construction drawings.

C. Joint treatment sand to be spread across the surface of the brick pavers for joint filling.

D. Vibratory compactor to be used to settle brick pavers in the setting bed to final grade. Finished surface grade for the unit pavers shall be within the specified tolerances.

3.6 PROTECTION

A. Refer to FDOT Standard Specifications Section 330-13 for protection of finished surface.

3.7 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from paving operations.

B. Sweep pavers and wash free of stains, discolorations, dirt, and other foreign material immediately prior to final acceptance.

END OF SECTION 02515

SECTION 02520 – PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. See Section 02200 for Earthwork.

1.2 DESCRIPTION OF WORK

A. Portland cement concrete paving as shown on Drawings, including pavement, parking areas, driveways, curbs, gutters, walkways, and pads.

1.3 SUBMITTALS

A. Shop Drawings: Layout of concrete pavement score lines and expansion joints.

B. Test Reports: All test reports required by this section and referenced related sections.

C. Certification: Written "Certificate of Compliance", signed by Contractor, that all concrete paving and curb materials and products, to be used on this project will comply with Standards referenced in the Specifications.

D. Samples: Where exposed aggregate treatments are used, exposed aggregate sample panel(s), approximately three (3) feet square, fabricated with specified materials and demonstrating the color, texture, pattern, edging and joint treatments proposed for use on this project. Accepted panel will be used to set quality standard for all related work on this project.

1. If so accepted by the Architect, sample panel(s) may be cost as, and remain as part of the work. Unaccepted panels must be removed from the work.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with local codes if more stringent than herein specified. Comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 2000 Edition, (FDOTSS), except as otherwise specified herein.

B. Do not change source of brands of cement and aggregate materials during course of the work.

C. Maintain accurate field records of time, date of placing, curing and removal of forms for

concrete work in each portion of the work.

D. Construction Tolerance: 1/8 inch in 10 feet for grade and alignment of top forms; 1/4 inch in 10 feet for vertical face on longitudinal axis.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store decorative exposed aggregates in segregated area to prevent mixing with foreign materials.

B. Deliver curing materials, admixtures, and retarders in manufacturer's standard, unopened containers with labels legible and intact. Store and protect from freezing and damage.

1.6 PROJECT CONDITIONS

A. Establish and maintain required lines and grade elevations.

B. Do not install concrete work over wet, saturated, muddy or frozen subgrade.

C. Protect adjacent work.

D. Provide temporary barricades, warning lights and signs as required for protection of work and public safety.

1.7 COOPERATION

A. Examine Drawings and Specifications for all Contracts, to determine nature of proposed construction. Perform work to conform with construction called for in such a manner as not to interfere or delay work of other Contractors.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms: Steel, wood, or other suitable material of sufficient size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion, defects and of height equal to full depth of concrete work.

1. Use flexible spring steel forms or laminated boards to form radius bends as required.

B. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

C. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185. Refer to Division 3 Section "Concrete Reinforcement".

1. Furnish in flat sheets, not rolls, unless otherwise acceptable to Architect.

D. Reinforcing Bars: New deformed steel bars, ASTM A 615, Grade 60.

E. Concrete Materials: ASTM C 150, Typ 1, Portland cement; ASTM C 33, normal weight aggregates; potable water. Comply with requirements of applicable Division 3 sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.

1. For concrete pavement use Class I concrete per FDOTSS Section 346 with a minimum compressive strength of 4000 psi at 28 days, 6 percent (plus or minus 1 percent) air entrained unless otherwise indicated.
2. For sidewalks, curb and gutters, concrete pads and other miscellaneous concrete site work, use Class I concrete per FDOTSS Section 346.

F. Expansion Joint Materials: Comply with requirements of the following for preformed expansion joint fillers and sealers:

1. Fillers: Preformed expansion joint fillers conforming to ASTM D-1752, ½" thickness. Filler material(s) selected must be compatible with sealant(s) to be used when applicable, and suitable for intended use.

2. Sealants: Meeting requirements of ASTM C920, Type M, Grade P or NS as required by application, Class 25, Use T, Color: gray, unless otherwise indicated.

G. Liquid-Membrane Forming and Sealing Curing Compound: Comply with ASTM C 309, Type I, Class A unless other type acceptable to Architect. Moisture loss no more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. "Masterseal"; Master Builders.
b. "A-H 3 Way Sealer"; Anti-Hydro Waterproofing Co.
c. "Ecocure"; Euclid Chemical Co.
d. "Clear Seal"; A. C. Horn.
e. "J-20 Acrylic Cure"; Dayton Superior.
f. "Sure Cure"; Kaufman Products Inc.
g. "AR -30"; W.R. Meadows.
h. "Spartan-Cote"; The Burke Co.
i. "Sealkure"; Toch Div. - Carboline.
j. "Kure-N-Seal"; Sonneborn-Contech.
k. "Polyclear"; Upco Chemical/USM Corp.
l. "L&M Cure"; L & M Construction Chemicals.
m. "Klearseal"; Setcon Industries.
n. "LR-152"; Protex Industries.
o. "Hardtop"; Gifford - Hill.

H. Bonding Compound: Polyvinyl acetate or acrylic base, rewettable type.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

a. "J-40 Bonding Agent"; Dayton Superior Corp.
b. "Weldcrete"; Larsen Products.
c. "Intralok"; W.R. Meadows.
d. "Everbond"; L & M Construction Chemicals.
e. "EucoWeld"; Euclid Chemical Co.
f. "Hornweld"; A. C. Horn.
g. "Sonocrete"; Sonneborn-Contech.
h. "Acrylic Bondcrete"; The Burke Co.

I. Epoxy Adhesive: ASTM C 881, 2-component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade", and "Class" to suit project requirements.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include but are not limited to the following:

a. "Epoxtite"; A. C. Horn.
b. "Edoco 2118 Epoxy Adhesive"; Edoco Technical Prod.
c. "Sikadur Hi-Mod"; Sika Chemical Corp.
d. "Euco Epoxy 463 or 615"; Euclid Chemical Co.
e. "Patch and Bond Epoxy"; The Burke Co.
f. "Sure-Poxy"; Kaufman Products Inc.

2.2 PAVEMENT MARKING PAINT

A. Traffic marking paint by Sherwin Williams; Traffic Paint by Pratt and Lambert, Inc.; Hi-Hide Plexicolor line paint by California Products Corporation, or approved equal.

1. Colors: As specified on the drawings.

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION

A. REFER TO SECTION 02200 Earthwork.

3.2 FORM CONSTRUCTION

A. Set forms to required grades and lines, braced and secured. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

1. Check completed formwork for grade and alignment to following tolerances:

    a. Top of forms not more than 1/8 inch in 10 feet.
    b. Vertical face on longitudinal axis, not more than 1/4 inch in 10 feet.

2. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.
3. Slope step treads at 1/4 inch per foot to drain.
4. Pitch walks/pads to have a minimum of 1/8 inch/ft. cross-slope, pitched toward low points.

3.3 REINFORCEMENT

A. Locate, place, and support reinforcement as specified in Division 3 sections, unless otherwise indicated.

    1. Install slip bars at all expansion joints.

3.4 CONCRETE PLACEMENT

A. General: Comply with requirements of Division 3 sections for mixing and placing concrete, as well as FDOTSS Section 350, and as herein specified.

B. Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase if required to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

C. Place concrete by methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.

D. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

E. Deposit and spread concrete in a continuous operation between transverse joints as far as possible. If interrupted for more than ½ hour, place a construction joint.

F. When adjacent pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained sufficient strength to carry loads without injury.

G. Curbs and Gutters: Automatic machine may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results that meet or exceed minimums specified. Machine placement must produce curbs and gutters to required cross-section, lines, grades, finish, and

jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

3.5 JOINTS

A. General: Construct expansion, weakened-plane (contraction), and construction joints true to line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the center line, unless otherwise indicated.

1. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:

1. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.

2. Sawed Joints: Form weakened-plane joints with powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.

3. Inserts: Use embedded strips of metal or sealed wood to form weakend-plane joints. Set strips into plastic concrete and carefully remove strips after concrete has hardened.

C. Walks/Pads: Score joints at approximately 5 ft. on center, unless otherwise noted on Plans. Use tool that produces "V" joint not over 1/4" wide.

D. Concrete Curbs: Score joints at approximately 5 ft. on center matching, as closely as possible, abutting walk joints. Use tool that produces "V" joint not over 1/4" wide.

E. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for more than ½ hour, except where such placements terminate at expansion joints.

1. Construct joints as shown or, if not shown, use standard metal keyway-section forms.
2. Where load transfer-slip dowel devices are used, install so that one end of each dowel bar is free to move.

F. Expansion Joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks, and other fixed objects, unless otherwise indicated.

1. Locate expansion joints in step construction where indicated on Drawings.
2. Locate expansion joints at maximum intervals of 30 ft. on center and at all beginnings and ends of radius at curbs. Match abutting walk expansion joints as much as possible.
3. Locate expansion joints at 50 feet o.c. for each pavement lane unless otherwise indicated.
4. Locate expansion joints at a maximum of every 225 sq. ft. of drive/pads with a minimum dimension one way between joints of 10 lin. ft.
5. Locate expansion joints at a maximum of 150 sq. ft. of walks/pads, except that maximum dimensions between joints in a linear walk to be no more than 30 ft.

G. Extend joint fillers full width and depth of joint, not less than ½ inch or more than 1 inch below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.

H. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.

I. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

J. Fill joints, with sealant, flush with top surfaces and tool concave, unless otherwise indicated.

K. Fillers and Sealants: Comply with requirements of applicable Division 7 sections for preparation of joints, materials, installation, and performance.

3.6 FIELD QUALITY CONTROL

A. Provide field quality control testing and inspection during concrete operations, utilizing Geotechnical Engineer and Testing Laboratory at contractor’s expense.

B. Contractor shall provide adequate notice, cooperate with, and provide access to the work, obtain samples, and assist the Geotechnical Engineer or their representatives in execution of their function.

C. Testing

1. Provide slump test on first load of concrete delivered each day and whenever requested due to changes in consistency or appearance of concrete.

2. Provide air indicator tests and air meter tests for all air-entrained concrete.

a. Perform air indicator test with a "Chase" AE 35 or equal air indicator, and air meter test in accordance with ASTM C231 or C173. Test first load of concrete delivered each day.

b. Furnish copies of field records and tests reports as listed for strength tests.

3. Strength testing:

    a. Provide 1 set of 3 test specimens for each 50 cu. yd. placed in any one day. Secure samples in accordance with ASTM C172 and mold specimens in accordance with ASTM C31.

    b. Test 1 specimen at 7 days and 2 specimens at 28 days in accordance with ASTM C39.

    c. Furnish copies of field records and test reports as follows:

        (1) 2 copies to Architect

        (2) 1 copy to Contractor

        (3) 1 copy to Ready Mix Supplier

    d. Record the exact location of the concrete in the work represented by each set of cylinders and show on test reports.

    e. Provide an insulated moist box for protection of the test cylinders until shipped to the laboratory.

D. Finishing and Sealing - See Division 3. Screed to grade and wood float, edge all sides, fine broom finish (except where otherwise indicated) and seal.

3.7 CONCRETE FINISHING

A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

B. After floating, test surface for trueness with a 10-ft. straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

C. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to ½-inch radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

D. After completion of floating and when excess moisture or surface sheen has disappeared, complete troweling and finish surface as follows:

    1. All flatwork to receive a fine broom finish by drawing a fine-hair broom across concrete surface perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Architect.

a. On inclined slab surfaces, provide a coarse, non-slip finish by scoring surface with a stiff-bristled broom, perpendicular to line of traffic.

3.8 CURING

A. Protect and cure finished concrete paving in compliance with applicable requirements of Division 3 sections. Use membrane-forming curing and sealing compound or approved moist-curing methods.

3.9 PAINTING OF PAVEMENT MARKINGS

A. Over clean pavement, following application and curing of sealer, apply parking line stripes and other pavement markings as indicated, per manufacturer's recommendations.

B. Apply by brush or zone marking equipment, one coat.

3.10 REPAIRS AND PROTECTIONS

A. Repair or replace broken or defective concrete, as directed by Architect.

B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage until acceptance of work. Concrete shall be protected from all stains. This includes gas, oil, diesel fuel spills, food and drink spills, tobacco juice, cutting oil from pipe work, and any other miscellaneous staining formed during construction. All staining shall be removed and cleaned prior to being accepted by the owner.

D. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

E. Sweep concrete walks and pavement and wash free of stains, discolorations, dirt, and other foreign material prior to final inspection.

F. Concrete work will not be accepted if damaged, cracked, uneven, stained or improperly graded.

END OF SECTION 02520

SECTION 02530 - SANITARY SEWAGE SYSTEMS

PART 1 -- GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. See Section 02200 for Earthwork.

1.2 DESCRIPTION OF WORK

A. Installation of all work necessary to provide sanitary sewer service to within 5 feet of the exterior of the building. Extent of sanitary sewage systems work is indicated on drawings and schedules, and by requirements of this section.

1.3 SUBMITTALS

A. Product Data: Submit complete materials list of items proposed for the work. Submit piping and sewer structures product data.

B. Sanitary Sewer Record Drawings: Legibly mark drawings to record actual construction. Indicate horizontal and vertical locations, referenced to permanent surface improvements. Identify field changes of dimension and detail and changes made by change order.

C. Certification: For all materials specified to comply with reference standards, submit Certificate of Compliance.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of sanitary sewage system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Materials and methods of construction shall comply with the following standards:

1. American Water Works Association, (AWWA).
2. American Society for Testing and Materials, (ASTM).
3. American Association of State Highway and Transportation Officials, (AASHTO).
4. American Concrete Pipe Association, (ACPA).
5. Comply with all rules, regulations, or ordinances having jurisdiction over this work. In absence of local codes, comply with the Uniform Plumbing Code.
6. The University of Florida Construction Standards.
7. Gainesville Regional Utilities (GRU) Construction Standards.
8. Florida Department of Transportation Standard Specifications for Road and Bridge

Construction, 1991 edition, (FDOTSS).

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle piping and accessories to prevent damage and deterioration. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. Gasket materials and plastic materials shall be protected from exposure to the direct sunlight. Storage facilities for plastic pipe, fittings, joint materials and solvents shall be classified and marked in accordance with NFPA No. 704 with classification as indicated in NFPA No. 49 and NFPA No. 325M.

1.6 COORDINATION

A. Coordinate locations and inverts of sanitary sewer lines at 5 feet outside building with Division 15.

1.7 PROJECT CONDITIONS

A. Known underground and surface utility lines are indicated on the drawings.

B. Protect existing trees, plant, lawns, and other features designated to remain as part of the landscape work.

C. Barricade open excavations and post warning lights at work adjacent to public streets and walks.

D. Promptly repair damage to adjacent facilities caused by sanitary sewer earthwork operations. Cost of repair at Contractor's expense.

E. Promptly notify the Project Engineer of unexpected sub-surface conditions.

1.8 COOPERATION

A. Examine Drawings and Specifications for all Contracts to determine the nature of proposed construction. Perform work to conform with construction called for in such a manner as not to interfere or delay work of other Contractors.

PART 2 -- PRODUCTS

2.1 IDENTIFICATION:

A. Underground-Type Plastic Line Markers: Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide green tape with black printing reading "CAUTION SEWER LINE BURIED BELOW".

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering identification markers which may be incorporated in the work include, but are

not limited to, the following:

a. Allen Systems, Inc.
b. Emed Co., Inc.
c. Seton Name Plate Corp.

B. Tracer Wire: 14 gauge insulated tracer wire shall be attached to all non-metallic piping.

2.2 PIPES AND PIPE FITTINGS:

A. General: Provide pipes of one of the following materials, of weight/class indicated. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.

B. Gravity Sewer Piping:

1. Polyvinyl Chloride (PVC) Pipe: Gravity Sewer Pipe per ASTM D3034, SDR 35.
2. Fittings shall conform to ASTM D3034 for gravity sewer pipe fittings.

C. Joints for Gravity Sewer Piping:

1. PVC Pipe: Integral Elastomeric bell joints and couplings complying with ASTM D3212 using elastomeric seals complying with ASTM F477.

2.3 Manholes and Structures

A. Frames and Covers: ASTM A48 gray cast-iron, asphalt coated, with lettering cast into top reading "SANITARY SEWER".

1. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

a. Neenah Foundry Co., Neenah, WI.
b. US Foundry, Miami, FL.

B. Concrete Masonry Units: ASTM C139.

C. Manhole Brick: ASTM C32, Grade MS.

D. Precast Concrete Manhole Barrels and Cones: ASTM C478, 5" wall thickness with ASTM C443 "0" - ring gasket joints
1. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

a. Southern Pre-cast, Inc., Alachua, FL.
b. Taylor Pre-cast, Green Cove Springs, FL.
c. Southern Culvert, Jacksonville, FL.

E. Mortar

1. Mortar for laying and parging concrete masonry: 1 part portland cement and 2 parts sand.
2. Mortar for brickwork: 1 part portland cement, ½ part hydrated lime, and 4-1/2 parts sand.

F. Manhole Rungs: Where specified, rungs or steps shall be polyvinyl chloride, polyethylene, fiberglass, or other non-corrosive material.

G. Manhole Drop Assembly: The vertical drop pipe and sweep shall be made from polyvinyl chloride (PVC) sewer pipe and fittings as specified herein. The fitting required for this work shall be molded PVC tees, plugs, and adapters. To the inside end of the tee, a threaded adapter shall be solvent welded, utilizing fresh solvent cement, made by the fittings manufacturer, containing at least 15 percent by weight of the same PVC compound used in making the fittings. Outside drop assemblies shall be encased in concrete as indicated on drawings.

H. Bedding Material: Clean subbase material conforming to requirements in Section 02315.

I. Backfill Material: As specified in Section 02315.

J. Pipe Connections: The precast reinforced concrete manhole sections shall be provided with circular openings at the locations and elevations for the proper connection of all pipes. Unless otherwise indicated, all PVC pipe connections shall be sealed with a flexible manhole seal assembly, per ASTM C-923. Flexible manhole seal assemblies shall permit at least an eight (8) degree deflection from the centerline of the opening in any direction while maintaining a watertight connection.

PART 3 -- EXECUTION

3.1 PREPARATION

A. Permits and Inspections: File all Drawings and obtain all necessary permits, licenses, and inspections required by authorities having jurisdiction over the work.

B. Layout sanitary sewer work and establish extent of excavation by area and elevation. Designate and identify datum elevation and project engineering reference points. Set required lines, levels and elevations.

C. Do not cover or enclose work of this Section before obtaining required inspections, test, approvals, and location recording.

D. Remove existing paving, including base material, as required to accommodate sanitary sewer work. Saw cut existing paving to provide uniform straight transition at new to existing paving.

3.2 EXISTING UTILITIES

A. Before starting excavation, establish the location and extent of underground utilities in the work area. Exercise care to protect existing utilities during earthwork operations. Perform excavation work near utilities by hand and provide necessary shoring, sheeting, and supports as work progresses.

B. Protect active utility services uncovered by excavation.

3.3 INSTALLATION OF IDENTIFICATION:

A. General: During back-filling of sanitary sewage systems, install continuous underground-type plastic line marker located directly over buried line at approximately 12” below finished grade.

B. During pipe laying of non-metallic piping, 14 gauge insulated tracer wire shall be installed as an attachment to the pipe prior to backfilling.

3.4 HANDLING PIPE:

A. Pipe and accessories shall be handled so as to insure delivery to the trench in sound, undamaged condition. Particular care shall be taken not to injure the pipe coating or lining. If the coating or lining of any pipe or fitting is damaged, the repair shall be made by the Contractor at his expense in a satisfactory manner. No other pipe or material of any kind shall be placed inside a pipe or fitting after the coating has been applied. Pipe shall be carried into position and not dragged. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Owner. Rubber gaskets that are not to be installed immediately shall be stored in a cool and dark place.

3.5 CUTTING OF PIPE:

A. Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Cutting shall be done with an approved type mechanical cutter. Wheel cutter shall be used when practical. Squeeze type mechanical cutters shall not be used for ductile iron.

3.6 LOCATING SEWER LINES NEAR WATER LINES:

A. Where the location of the sewer is not clearly defined by dimensions on the drawings, the sewer shall not be laid closer horizontally than 10 feet from the water pipe except where the bottom of the water pipe will be at least 18" above the top of the sewer pipe, in which case the sewer shall not be laid closer horizontally than 6 feet from the water pipe. Where gravity-flow sewers cross above water lines, the sewer pipe for a distance of at least 10 feet on each side of the crossing shall be fully encased in concrete or shall be made of pressure pipe. The minimum cover of the concrete encasement including that at the pipe joints shall not be less than 6" unless otherwise indicated on the drawings.

Water and sanitary line crossings shall be at the mid points of full lengths of both pipes.

3.7 CROSSING ROADWAY DITCHES:

A. Where sewer lines cross a ditch with less than three feet of cover, ductile iron pipe with appropriate end fittings shall be provided for a distance of 9 feet on each side of the crossing as shown on detail drawings.

3.8 SEWER LINES AT STRUCTURES;

A. Where shown on the drawings, the sewer pipe shall be sleeved as required. Care shall be exercised and proper precautions taken during installation of the sewer pipe and sleeve to assure that there will be no damage to such structures and no settlement or movement of foundations or footings. Any damage occurring as a result of the Contractor's operation shall be corrected and all costs connected there with shall be borne by the Contractor. When the sewer pipe location is within 3 feet of a proposed building, retaining wall, or structural foundation as stated above, the pipe shall be sleeved as required for an existing structure.

3.9 TRENCHING

A. Perform excavating and backfilling as required to install sanitary sewer work. Trenching, excavation, and backfilling shall be performed in accordance with manufacturer’s recommendations and Section 02315.

B. Provide trench wall support and pumping of surface and ground water as required to provide suitable conditions for performing the work.

C. Excavate trenches to accommodate indicated bedding conditions and material. Trim and shape trench bottoms to proper line and grade, free of irregularities. Remove unstable material and replace with compacted fill.

3.10 PLACING AND LAYING OF PIPE

A. Pipe shall be protected during handling against impact shocks and free fall and the pipe interior shall be free of extraneous material.

B. Gravity Sewer Piping

1. Pipe laying shall proceed upgrade with the spigot ends of bell-and-spigot pipe pointing in the direction of the flow. Each pipe shall be laid accurately to the line and grade shown on the drawing by use of a laser projector in the downstream manhole. Lay and fit pipe with sealed joints and full bearing in bedding material. Laser alignment shall be set as directed by the Contractor's surveyor. Blowers shall be utilized to assure uniform temperatures within the pipe to keep laser beam straight. Pipe shall be laid and centered so that the sewer has a uniform invert. As the work progresses, the interior of the sewer shall be cleared of all superfluous materials.
2. Before making pipe joints, all surfaces of the portions of the pipe to be joined shall be clean and dry. Lubricants, and primers, shall be used as recommended by the pipe

manufacturer. The joints shall then be placed, fitted, joined, and adjusted so as to obtain the degree of water tightness required.

3. Installation of PVC pipe shall be installed in accordance with ASTM D2321 and ASTM F402, and all required precautions shall be taken to assure adequate trench ventilation and protection for workers installing the pipe.

C. Trenches shall be kept free of water and as dry as possible during bedding, laying, and jointing and for as long a period as required. When work is not in progress, open ends of pipe and fittings shall be satisfactorily closed so that no trench water or other material will enter the pipe or fittings.

D. Install pipe joint gaskets in accordance with manufacturer's recommendations.

E. Cut pipe ends entering structures flush with inner face of structures.

F. Extend sanitary sewer system as shown on drawings and make required connection.

G. Backfill trenches to subgrade with material as specified under Section 02335.

1. Backfill trenches in 6" compacted layers until there is a cover of not less than 24" over piping. Place remaining backfill material in 12" compacted layers.
2. Backfill evenly on both sides of piping for its full depth. Provide thorough compaction of fill under pipe haunches.
3. Provide granular backfill at all paved areas and in building areas, per Section 02315.

H. Mechanically compact backfill in accordance with Section 02315 requirements. Water settling, puddling, and jetting as a compaction method are not acceptable.

I. Fill, compact, and restore to subgrade level and condition all settlement.

J. Replace paving, lawns, and finished surfaces removed to accommodate the sanitary sewer system, except where new surfaces are provided as part of the work.

3.11 ALIGNMENT TEST

A. After the pipelines have been installed and the trench satisfactorily backfilled and compacted, all sanitary sewer mains 8 inches diameter and greater shall be inspected for misalignment and displacement by television camera testing in accordance with University requirements. Television testing shall at contractor’s expense.

B. Television camera testing video shall be turned over to the University Physical Plant Division for review and approval.

C. Should the video of the pipeline reveal poor alignment, displaced pipe, or any other defect, the Contractor shall undertake such remedial action as required to correct the defect. The pipeline shall be retested following any corrective action. All corrective action shall be performed at no additional cost to the Owner and prior to any leakage tests.

3.12 LEAKAGE TEST:

A. Sanitary sewer shall be tested throughout their entire length for water tightness. Pipelines installed shall satisfy the requirements of the tests as specified. The Contractor shall make necessary repairs or replacements and re-test as required to comply with these regulations. Testing, correction, and retesting shall be made at no additional cost to the Owner.

B. The Contractor shall furnish all necessary and approved material, equipment, labor and other facilities required to satisfactorily perform the test including furnishing and placing of low head weirs, depth gauges, and bulkheads for testing. Weirs shall be of appropriate type (90, 60, 45, 22-1/2, or as required) for the flows to be measured.

C. Prior to testing, pipe shall be thoroughly cleaned of accumulated silt or debris.

D. A section of sewer as referred to in the Specification for testing shall be defined as a length of sewer line between any two consecutive manholes in a sewer line.

E. Infiltration test shall be made on a section, or sections of sewer when directed, after backfilling has been completed and after a sufficient interval of time has elapsed to permit the groundwater to rise up to its normal level. Infiltration tests shall only be run on sewers where the groundwater level is normally at least 2 feet above the top of the sewer. Initially tests shall be performed on one section at a time. After the Contractor has demonstrated a record of tight sewers based on the results of the tests, the Architect at his option, may call for subsequent tests to be made on longer lengths up to 1000 linear feet.

F. Normal groundwater level, as herein referred to, shall be the elevation to which the groundwater will rise at the time of test, when unaffected by any dewatering operations within the area of influence.

G. The Contractor shall furnish and install an approved type low head measuring weir or other approved method in the invert at the downstream end of the section together with all other necessary facilities as may be required to properly perform the test. It is intended that the test be made as soon as thereafter as the groundwater has risen to its normal level to the satisfaction of the Architect and necessary facilities for conducting the test are in position.

H. Exfiltration tests shall be substituted for infiltration tests where the groundwater is lower than an elevation 2 feet above the top of the pipe. Test shall be conducted by sealing off sections to be tested, filling manholes and pipe to an elevation of 2 feet over the crown, as measured from the upstream point. The filled line shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be re-established. The amount of water required to maintain this water level during a 2-hour test period shall be measured. The Contractor shall dispose of all water at the end of the test.

I. A continuous twenty-four (24) hour test period will be required except where, in the opinion of the Architect a longer test period is necessary. The maximum allowable

quantity of infiltration of leakage into the section of sewer shall be 0.12 gallons per hour per inch of internal diameter for each one hundred linear feet of sewer under test. There shall be no separate infiltration allowance for manholes except that manholes shall not be deducted from the length of pipe used in computing the total infiltration allowance for the section under test.

J. Allowable exfiltration shall be at the same rate as for infiltration.

K. Any section or sections of sewer which does not fully comply with the requirements of the infiltration or exfiltration test as specified shall be satisfactorily repaired by the Contractor at his expense, and additional tests shall be made until the specified allowable leakage has been fully satisfied.

3.13 REPAIRS TO BROKEN PIPE:

A. Where cracks or ruptures develop in the pipe after installation, the entire length of pipe to a distance of at least 3 feet beyond the pipe joint on each side of the damage area shall be re-excavated. The pipe shall be replaced, or if approved by the Architect, shall be repaired in a suitable manner. Details of repairs shall be submitted for record. If the Contractor utilizes concrete cradle or encasement in his repair, he shall take precautions to guard against shear breaks at the limits of the concrete. Repaired sections shall be reinspected approximately 6 months after completion of the repair. Should additional failures be noted, they shall be promptly repaired and later reinspected as approved and at no additional cost to the Owner.

3.14 MANHOLE STRUCTURES

A. Manholes and concrete structures utilized as part of the work shall conform to FDOTSS Section 425.

B. Masonry Manholes

1. Install masonry manhole structures on a sound cast-in-place segmented concrete base.
2. Lay radial and batter concrete masonry with full mortar joints completely filled with portland cement mortar. Strike joints flush with surface of concrete masonry.
3. Horizontal joints shall not exceed ½". Vertical joints shall not exceed 1/4" on their interior surface.
4. Provide headers where required to adjust frames to grade, breaking joints between courses.
5. Parge inside and outside face of masonry structure walls with ½" mortar.

C. Precast Concrete Manholes

1. Place precast concrete manhole sections as indicated. Where manholes occur in pavements, set tops of frames and covers flush with finish surface. Elsewhere, set tops 3" above finish surface, unless otherwise indicated.

   a. Install in accordance with ASTM C891.

b. Provide rubber joint gasket complying with ASTM C443 at joints of sections.

D. Construct flow channels with concrete or brick, conforming to the inside diameter of connecting lines. Make changes in grade gradually and make changes in line with true curves.

E. Set frames and covers to required grade and bed in place with mortar.

F. Cold weather protection: Provide all necessary means for heating concrete, masonry materials, and mortar to protect concrete and masonry work during and after installation from damage by frost and freezing.

G. Perform no work when the temperature is below 25 degrees F. (ambient).

H. Drop manhole assemblies shall be constructed per detail on plans.

3.15 CLEANOUTS

A. Furnish and install where shown on Drawings all exterior cleanouts extended to finished grade, with solid cover, of size indicated on Drawings. Where cleanouts occur in lawn or paved area, provide concrete collar per detail.

3.16 CONNECTIONS TO EXISTING MANHOLES:

A. Pipe connections to existing manholes shall be made in such manner that the finished work will conform as nearly as practicable to the essential applicable requirements specified for new manholes, including all necessary concrete work, cutting, and shaping.

3.17 BUILDING CONNECTIONS:

A. Shall include the lines to and connection with the building waste drainage piping at a point approximately 5 feet outside the building, unless otherwise indicated. Where building drain piping is not installed, the Contractor shall terminate the building connections approximately 5 feet from the site of the building at a point and in a manner designated by the Architect.

3.18 TAP CONNECTIONS:

A. Make connections to existing piping and underground structures, so that finished work will conform as nearly as practical to requirements specified for new work.

3.19 DISPOSAL OF WASTE MATERIALS

A. Stockpile, haul from site, and legally dispose of waste materials, including excess excavated materials, rock, trash, and debris.

B. Maintain disposal route clear, clean, and free of debris.

3.20 CLEANING

A. Maintain sanitary sewer piping and structures in a clean workable condition during construction operations.

B. Flush sanitary sewer system with water in sufficient volume to obtain free flow through each line. Remove all silt, trash, and debris just prior to acceptance of work.

C. Upon completion of sanitary sewer work, remove tools and equipment. Provide site clear, clean, free of debris, and suitable for continued site work operations.

END OF SECTION 02530

SECTION 02630 - STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related Sections: The following sections contain requirements that relate to this Section:
   1. See Section 02200 for Earthwork.
   2. See Section 02520 for Portland Cement Concrete Paving

C. Division 15 Sections for storm sewer work within the building structure and to 5 feet outside building foundation walls, including final connections to storm sewer lines provided under work of this Section.

1.2 DESCRIPTION OF WORK

A. Storm Drainage includes all conveyance and distribution systems for stormwater runoff control.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data and installation instructions for storm sewage system materials.

B. Certificates:

   1. Pipeline and fittings, including factory-applied linings and joint materials.

C. Shop Drawings: Submit shop drawings for storm sewage systems, showing piping materials, size, locations, and inverts. Include details of underground structures, connections, and manholes. Show interface and spatial relationship between piping and proximate structures.

D. Record Drawings: At project close-out, submit record drawings of installed storm sewage piping and products, in accordance with requirements of Division 1.

E. Maintenance Data: Submit maintenance data and parts lists for storm sewage system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 1.

1.4 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of storm sewage

system's products of types, materials, and sizes 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 on projects with storm sewage work similar to that required for project.

C. Codes and Standards: : Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified.

1. Florida Department of Transportation Standard Specifications for Road and Bridge Construction 2000 edition, (FDOTSS).
2. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of storm sewage system's materials and products.
3. Environmental Compliance: Comply with applicable portions of local Environmental Agency regulations pertaining to storm sewage systems.

PART 2 - PRODUCTS

2.1 IDENTIFICATION:

A. Underground-Type Plastic Line Marker: Manufacturer’s standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide green tape with black printing reading "CAUTION SEWER LINE BURIED BELOW".

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering identification markers which may be incorporated in the work include, but are not limited to, the following:

1. Allen Systems Inc.
2. Emed Co., Inc.
3. Seton Name Plate Corp.

2.2 PIPES AND PIPE FITTINGS:

A. In addition to the following listed requirements, all piping and fittings shall conform to FDOTSS. In the event a conflict exists between the following requirements and FDOTSS, then FDOTSS shall prevail.

B. General: Provide pipes of one of the following materials, of weight/class indicated. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.

C. Storm Lines less than 15 inches in diameter: Contractor shall install the type of pipe specified on the drawings. Where appropriate or desired for good cause, the contractor

may request a pipe material alternate option. Any alternate or substitution shall be approved by the Project Engineer for both material type and cost adjustment.

1. Concrete Pipe: ASTM C 14, Class 2 nonreinforced concrete pipe.
2. Polyvinyl Chloride (PVC) Pipe: Schedule 80, ASTM D 1785.
3. Corrugated Polyethylene Pipe: High density corrugated polyethylene smooth interior pipe, manufactured in conformity with the latest AASHTO specification of M294 Type S or SP, and the material compound shall conform to ASTM D3350.
4. Ductile Iron Pipe: ANSI/AWWA C150/A21.5 & C151/A21.51.

D. Storm Lines 15 inch diameter or larger: Contractor shall install the type of pipe specified on the drawings. Where appropriate or desired for good cause, the contractor may request a pipe material alternate option. Any alternate or substitution shall be approved by the Project Engineer for both material type and cost adjustment.

1. Concrete Pipe: ASTM C 76, Class III, reinforced concrete pipe, unless specifically requested Class IV or IV for additional protection.

B. Pipe Fittings

1. Concrete Pipe: Reinforced or non-reinforced concrete fittings to match type and strength of concrete pipe being joined. Tongue-and-groove gasketed joints complying with ASTM C 443.
2. PVC Pipe: Bell and spigot elastomeric joints shall conform to ASTM D3212 and shall be assembled with gaskets conforming to ASTM F477. Assembly shall be per manufacturer's specifications.
3. Corrugated Metal Pipe: Comply with the requirements of AASHTO M36 and in addition include neoprene gaskets as indicated in the technical manual of the National Corrugated Steel Pipe Association. Design to provide strength to preserve pipe alignment, to prevent separation of pipe to prevent filtration of fill material and penetration of roots into pipe, and to prevent seepage of storm water out of pipe.
4. Ductile Iron Pipe: Push on joints such as Tyton or Fastite in accordance with ANSI/AWWA C111/A21.11 complete with all necessary accessories.
5. Corrugated polyethylene Pipe: Conform to AASHTO M 294, with the material conforming to ASTM D3350.

2.3 CONCRETE INLETS, MANHOLES, AND JUNCTION BOXES

A. In addition to the following listed requirements, all concrete inlets, manholes, and junction boxes shall conform to FDOTSS (Section 425). In the event a conflict exists between the following requirements and FDOTSS, then FDOTSS shall prevail.

B. Units shall be manufactured in accordance with ASTM C478, Specifications for Precast Reinforced Concrete Manhole Risers and Tops.

C. Concrete to be minimum 3000 psi at 28 days.

D. Joints between units shall be made using flexible watertight rubber gaskets, Portland Cement mortar or approved jointing compound, at Contractor's option and to meet local regulations.

E. Include cast iron steps and traps where indicated, at all required openings.

F. Manufacturers: Subject to compliance with requirements, provide products as indicated on the drawings. These products may be obtained from the following suppliers:

1. Southern Pre-cast, Inc., Alachua, FL.
2. Taylor Pre-cast, Green Cove Springs, FL
3. Southern Culvert, Jacksonville, FL

2.4 DRAINAGE STRUCTURE CASTINGS

A. Material: Gray iron castings, ASTM A48-76 Class 30B.

B. Finish: One coat of high grade bituminous asphalt paint, Federal Spec. MIL-C-4508, on all castings except where field painting is indicated. Surface preparation for shop priming and field painting shall be SSPC-SP10 near-white blast cleaning and prime paint shall be equivalent to Tnemec 66-1211 Epoxoline Primer applied in accordance with manufacturers written recommendations.

C. Manufacturer: The products of the Neenah Foundry Company, Neenah, Wisconsin may have been indicated on the Drawings by catalog number to establish the types and quality of products expected. Equivalent products as manufactured by, but not limited to, the US FOUNDRY Company Miami, FL are acceptable.

D. Grate covers shall be identified by the casting of the words “Storm Sewer”.

PART 3 - EXECUTION

3.1 INSTALLATION OF IDENTIFICATION:

A. General: During back-filling/top-soiling of storm sewage systems, install continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade.

3.2 INSTALLATION OF PIPE AND PIPE FITTINGS:

A. General: Install piping in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated.

B. Bedding: Round trench bottom so that pipe has firm bearing on well-compacted soil or on undisturbed soil. Provide minimum of 4" sand cushion where bedrock or broken rock

exists on trench bottom. Excavate bell hole by hand. Do not lay pipe in wet trench. Do not permit water in trench until joints are set.

C. Inspect piping before installation to detect apparent defects. Mark defective materials with white paint and promptly remove from site.

D. Lay pipe true to line and grades. Begin at low end. Place spigot ends facing downstream. Center spigot in bells with inverts smooth and uniform. Protect exposed ends against impact, dirt, cement, and debris. A perfect circle shall be evident when "lamped". Install rubber gasket or caulked joints per manufacturer's recommendations.

E. Install gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements.

F. Ductile Iron Pipe: Install in accordance with manufacturer’s recommendations and DIPRA installation guide.

G. Concrete Pipe: Install in accordance with applicable provisions of ACPA "Concrete Pipe Installation Manual".

H. Plastic Pipe: Install in accordance with manufacturer's installation recommendations, and in accordance with ASTM D 2321.

I. Cleaning Piping: Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.
2. Place plugs in ends of uncompleted conduit at end of day or whenever work stops.
3. Flush lines between manholes if required to remove collected debris.

J. Joint Adaptors: Make joints between different types of pipe with standard manufactured adapters and fittings intended for that purpose.

K. Cushion Sand: Apply by hand. Compact by approved mechanical means.

1. Lines 24" in diameter or less - Apply around pipe to 6" above pipe.
2. Lines larger than 24" in diameter - Apply around pipe to 6" above centerline of pipe.

L. Closing Abandoned Utilities: Close open ends of abandoned underground utilities which are indicated to remain in place. Provide sufficiently strong closures to withstand hydrostatic or earth pressure which may result after ends of abandoned utilities have been closed.

1. Close open ends of concrete or masonry utilities with not less than 8" thick brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable

methods suitable for size and type of material being closed. Wood plugs are not acceptable.

M. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.

1. Make inspections after lines between manholes, or manhole locations, have been installed and approximately 2' of backfill is in place, and again at completion of project.
2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, correct such defects, and re-inspect.

3.3 DRAINAGE STRUCTURES

A. Inlets, Manholes, & Junction Boxes

1. Set all structures true to grade and location, utilizing a licensed surveyor for establishing location and project elevation benchmark.
2. Dewater as necessary to install all structures and utilize proper excavation and fill techniques in accordance with all other sections of these specifications.
3. Construct masonry or precast concrete structures as detailed, joints completely filled, wet brick thoroughly, strike joints flush, parge exterior of brick structures, build in all castings as detailed.
4. Precast structure: Place on prepared subgrade per detail and manufacturer's recommendations and specifications.
5. Grout inverts of bottom of structures cleanly for smooth flow in and out of structures.
6. Brick and mortar all open space in pipe penetrations into structures. Cleanly sawcut and remove any pipe protrusions into the structures. Grout smoothly any holes or deformities within the structure that could affect drainage flow.
7. Protect structures from siltation collection during construction by using proper erosion controls, such as filter fabrics, silt fencing, haybales, gravel blankets, sumps, or other measures as applicable and appropriate.
8. Remove all accumulated sediment from construction activity within structures.

3.4 BACKFILLING:

A. General: Conduct backfill operations of open-cut trenches closely following laying, jointing, and bedding of pipe, and after initial inspection and testing are completed.

1. To minimize local area traffic interruptions, allow no more than 100' between pipe laying and point of complete backfilling.

3.5 FIELD QUALITY CONTROL:

A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction.

B. Lamp all completed piping systems from structure to structure to assure proper installation and joint integrity and assure piping system has been thoroughly flushed and cleaned and no blockages have occurred or remain.

C. Remove all accumulated deposits, debris, and sediment from storm drainage system by thoroughly flushing and cleaning the entire storm drainage system. Monitor and remove any flushed deposits, debris, and sediment from downstream receiving body, structure, or outfall.

END OF SECTION 02630

SECTION 02660 - WATER SERVICE PIPING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

A. This Section includes water service piping and appurtenances for domestic water and fire service from the source of potable water to a point 5 feet outside the building.

B. The Contractor shall coordinate installation with Physical Plant Division (PPD) for connection to the public water transmission system. Contractor shall verify that permitting has been obtained prior to installation, and shall follow all permit criteria.

C. Related Sections: The following Sections contain requirements that relate to this Section:
1. See Section 02200 for Earthwork.
2. See Section 02720 for Storm and Sanitary Sewerage.
3. See Section 15140 for Domestic Water Piping for interior building water piping systems and equipment.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data for pipes, fittings, valves, water meter, and identification devices.
2. Shop drawings for pre-cast concrete meter pit, including frames and covers.
3. Shop drawings for cast-in-place concrete meter pit, including frames and covers.
4. Record drawings at project closeout of installed water service piping and products in accordance with requirements of Division 1.
5. Maintenance data for valves and water meter, for inclusion in Operating and Maintenance Manuals specified in Division 1 Section "Project Closeout."

1.4 QUALITY ASSURANCE:

A. Comply with requirements of The University of Florida Construction Standards.

B. Testing: Hydrostatic tests at minimum 2 time working pressure for 2 hours.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Preparation for Transport: Prepare valves for shipping as follows:

B. Ensure valves are dry and internally protected against rust and corrosion.

C. Protect valves against damage to threaded ends, flange faces, and weld ends.

D. Set valves in best position for handling. Set gate valves closed to prevent rattling.

E. Storage: Use the following precautions for valves during storage:
   1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
   2. Protect valves from weather. Store valves indoors. Maintain valve temperature higher than the ambient dew point temperature. If outdoor storage is necessary, support valves off the ground or pavement in watertight enclosures.

F. Handling: Use a sling to handle valves whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.

1.6 PROJECT CONDITIONS:

A. Site Information: Perform site survey, research utility records, and verify existing utility locations. Verify that water service piping may be installed in compliance with the original design and referenced standards.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate connection to public water main with PPD.

B. Coordinate with interior water distribution piping.

C. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Gate Valves:

   1. American Darling Valve; Div. of American Cast Iron Pipe Co.
   2. Clow Valve Co.; Div. of McWane, Inc.
   3. Mueller-Hersey; A Grinnell Co.
   4. Waterous Co.

C. Tapping Valves:

1. Clow Valve Co.; Div. of McWane, Inc.
2. Mueller-Hersey; A Grinnell Co.
3. American Darling

D. Fire Hydrants, Post Type:

1. Mueller-Hersey; A Grinnell Co.
2. American Darling.

E. Water Meters:

1. Badger Meter, Inc.
2. Mueller-Hersey; A Grinnell Co.

F. Underground Warning Tapes:

1. Allen Systems, Inc.; Reef Industries, Inc.
2. Brady (W.H.) Co.; Signmark Div.
3. Calpico, Inc.
4. Carlton Industries, Inc.
5. EMED Co., Inc.
6. Seton Name Plate Co.

2.2 PIPE AND PIPE FITTINGS, GENERAL:

A. Pipe and pipe fitting materials shall be compatible with each other. Where more than one type of material or product is indicated, selection is Installer's option.

B. Ductile-Iron Pipe 3 Inches and Larger: AWWA C151, Class 51 for push-on joint pipe, Class 53 for flanged joint pipe.

1. Lining: AWWA C104, cement mortar, sealcoated.
2. Gaskets: AWWA C111.
3. Ductile-Iron and Cast-Iron Fittings: AWWA C110, ductile-iron or cast-iron, 250-psi pressure rating; or AWWA C153, ductile-iron compact fittings, 350-psi pressure rating.
   a. Lining: AWWA C104, cement mortar.
   b. Gaskets: AWWA C111, rubber.

C. Galvanized Steel Pipe (GSP) Smaller than 3 Inches:

D. Polyvinyl Chloride (PVC) pipe smaller than 3 inches: Shall be schedule 80 per ASTM D 1785.

2.3 VALVES:

A. Nonrising Stem Gate Valves 3 Inches and Larger: AWWA C500, cast-iron double disc,

bronze disc and seat rings, or AWWA C509, resilient seated; bronze stem, cast-iron or ductile-iron body and bonnet, square operating nut, 200-psi working pressure, mechanical joint ends.

B. Valve Boxes: Cast-iron box having top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.

1. Provide a steel tee-handle operating wrench with each valve size. Wrench shall have tee handle with one pointed end, stem of length to operate valve, and socket fitting valve operating nut.

C. Tapping Sleeve and Tapping Valve: Provide a complete assembly, including tapping sleeve, tapping valve, and bolts and nuts. The sleeve and the valve shall be compatible with the tapping machine to be used.

1. Tapping Sleeve: Stainless Steel bolted sleeve with flanged outlet for new branch connection. Sleeve may have mechanical joint ends with rubber gaskets or have sealing rings in the sleeve body. Sleeve shall mate with the size and type pipe material being tapped. Outlet flange shall be size required for branch connection.

2.4 ANCHORAGES:

A. Clamps, Straps, and Washers: ASTM A 506, steel.

B. Rods: ASTM A 575, steel.

C. Rod Couplings: ASTM A 197, malleable iron.

D. Bolts: ASTM A 307, steel.

E. Cast-Iron Washers: ASTM A 126, gray iron.

F. Concrete Reaction Backing: Portland cement concrete mix, 3000 psi.

1. Cement: ASTM C 150, Type I.
2. Fine Aggregate: ASTM C 33, sand.
3. Course Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

2.5 FIRE HYDRANTS:

A. Fire Hydrants, Post Type: Nonfreeze, post type, dry barrel, break-away type with 5 ¼ inch seats, meeting AWWA C502, 6-inch inlet, working pressure 200psi, tested to 400psi. Hydrants shall be bronze casing, cast-iron or cast-aluminum casing guard, and tapped drain port in valve housing. Hydrant shall be of length required for installation of inlet valve 36 inches below final grade.

B. Connections: Two 2 ½ inch and one 4 ½ inch. Nozzle section shall be able to rotate 360 degrees during installation.

2.6 METER PIT:

A. Concrete: Portland cement mix, 3000 psi.

1. Cement: ASTM C 150, Type I.
2. Fine Aggregate: ASTM C 33, sand.
3. Course Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Reinforcement: Steel conforming to the following:

1. Fabric: ASTM A 185, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615, Grade 60, deformed.

2.7 WATER METER:

A. General: Provide water meter with registration in hundreds or thousands of gallons.

B. Water Meter - 2 Inches and Smaller: AWWA C700, disc type, bronze case.

C. Water Meter - 3 Inches and Larger: AWWA C702, compound type, bronze case.

2.8 IDENTIFICATION:

A. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - WATER LINE BURIED BELOW."

2.9 TRACER WIRE:

A. Wire: Solid copper wire, No. 12 or larger.

PART 3 – EXECUTION

3.1 PREPARATION OF BURIED PIPE FOUNDATION:

A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation throughout the length of the piping.

B. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with clean sand or pea gravel to indicated level.

C. Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped sand backfill. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.2 INSTALLATION OF PIPE AND PIPE FITTINGS:

A. Ductile-Iron Pipe: Install with cement-mortar-lined, ductile-iron or cast-iron, mechanical joint or push-on joint fittings and rubber gaskets in accordance with AWWA C600.

B. PVC (Polyvinyl Chloride) Pipe: Install with cement-mortar-lined, ductile-iron or cast-iron, mechanical joint or push-on joint fittings and rubber gaskets in accordance with AWWA M23. Install continuous tracer wire from connection to connection with minimum 36" excess wire in each valve box.

C. Depth of Cover: Provide minimum cover over piping of 36 inches below finished grade.

D. Water Main Connection: Tap water main with size and in location as indicated, in accordance with requirements of PPD.

E. Install tapping sleeve and tapping valve in accordance with manufacturer's installation instructions.

3.3 INSTALLATION OF VALVES:

A. General Application: Use mechanical joint end valves for 3-inch and larger buried installation. Use threaded and flanged end valves for installation in pits and inside building. Use bronze valves, with ends compatible to piping, for 2-inch and smaller installation.

B. AWWA-Type Gate Valves: Comply with AWWA C600. Install buried valves with stem pointing up and with cast-iron valve box.

3.4 INSTALLATION OF ANCHORAGES:

A. Anchorages: Provide anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches.

3.5 APPLICATION OF PROTECTIVE COATINGS:

A. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.6 INSTALLATION OF HYDRANTS:

A. Install fire hydrants in pavement or with concrete anchor, as indicated.

B. Centerline of pumper nozzle shall be a minimum of 18 inches and a maximum of 22 inches above final grade.

3.7 INSTALLATION OF WATER METER PIT:

A. Construct of poured-in-place or pre-cast concrete of dimensions indicated, with cover. Provide sleeves for pipe entry and exit.

B. Water Meter: Install water meter in accordance with AWWA M6, in meter pit, in location and with support as indicated. Provide 3-valve bypass around meter, full size of water service piping.

3.8 INSTALLATION OF IDENTIFICATION:

A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.

B. Attach nonmetallic piping label permanently to main electrical meter panel.

3.9 FIELD QUALITY CONTROL:

A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have sufficiently hardened. Fill pipeline 24 hours prior to testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.

1. Increase pressure in 50-psi increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psi. Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within above limits.

3.10 CLEANING:

A. Clean and disinfect water distribution piping as follows:

1. Purge all new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired, prior to use.
2. Use the purging and disinfecting procedure prescribed by the authority having jurisdiction or, in case a method is not prescribed by that authority, use the procedure described in AWWA C651, or as described below:
   a. Fill the system or part thereof with a water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) the system or part thereof and allow to stand for 24 hours.

b. Drain the system or part thereof of the previous solution and refill with a water/chlorine solution containing at least 200 parts per million of chlorine and isolate and allow to stand for 3 hours.
c. Following the allowed standing time, flush the system with clean, potable water until chlorine does not remain in the water coming from the system.
d. Submit water samples in sterile bottles to the authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination.

3. Prepare reports for all purging and disinfecting activities.

3.11 VALVE SCHEDULE:

A. Nonrising Stem Gate Valves - 4 Inches and Larger:

MANUFACTURER	AWWA - C500	MECH JOINT - C509
American Darling	55	85
Clow Valve	F-5065	F-6100
Kennedy Valve	571X	1571X
Mueller-Hersey	A-2380-20	A-2370-20
Stockham Valve	G-743-O	G-701-O
U.S. Pipe	3460	5460
Waterous	300 Series	500 Series

B. Rising Stem Gate Valves - 3 Inches and Larger:

MANUFACTURER	AWWA - C500	FLANGED - C509
American Darling	52	82
Clow Valve	F-5072	F-6136
Kennedy Valve	566	1566
Mueller-Hersey	A-2483-6	A-2373-6
U.S. Pipe	3630	5120
Waterous	300 Series	500 Series

C. Nonrising Stem Gate Valves - 2 Inches and Smaller:

MANUFACTURER	MSS SP-80 THREADED
Hammond Valve Corp.	IB645
Jenkins Bros.	370
Milwaukee Valve Co.	1105M
Nibco	T-113 w/iron HW
Stockham Valve	B-103

D. Tapping Valves:

MANUFACTURER	
American Darling	565 or 865

Clow Valve	F-5093
Kennedy Valve	950X
Mueller-Hersey	H-667
U.S. Pipe	3860

E. Fire Hydrants, Post Type:

MANUFACTURER
Mueller-Hersey
American Darling

3.12 WATER METER SCHEDULE:

A. Disc-Type Water Meter:

MANUFACTURERS	AWWA C700
Badger Meter	Recordall, bronze
Mueller-Hersey	400, 500 Series

END OF SECTION 02660

SECTION 02800 – SITE IMPROVMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

B. Related Sections: The following sections contain requirements that relate to this Section:
   1. See Section 02200 for Earthwork.
   2. See Section 02520 for Portland Cement Concrete Paving

1.2 DESCRIPTION OF WORK

A. Site improvements includes benches, trash receptacles, bicycle racks, and traffic bollards.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data and installation instructions site improvement materials.

B. Record Drawings: At project close-out, submit record drawings of installed site improvements and products, in accordance with requirements of Division 1.

E. Maintenance Data: Submit maintenance data and parts lists for site improvement materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 1.

1.4 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of storm sewage system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified.

   1. Florida Department of Transportation Standard Specifications for Road and Bridge Construction 2000 edition, (FDOTSS).
   2. University of Florida construction standards

PART 2 - PRODUCTS

2.1 GENERAL:

A. Benches: Benches shall be as specified in the construction drawings and shall be in conformance with UF design standards.

B. Trash Receptacles: Metal type, approved by UF PPD.

C. Bicycle Racks: Bicycle racks shall be u-rack style in accordance with UF design standards. Bicycle rack locations and installation shall be in accordance with the Construction drawings and the UF construction design standards.

D. Traffic Bollards: Shall be placed and installed as shown on the Construction drawings.

PART 3 - EXECUTION

3.1 INSTALLATION OF IDENTIFICATION:

A. General: All site improvement items shall be installed in accordance with the Manufacturer's specifications and requirements. All Manufacturer's material accompanying shall be submitted to the Owner upon completion of the project, including, but not limited to, specifications, installation, maintenance, and warranty information.

3.5 FIELD QUALITY CONTROL:

A. All site improvement items shall be kept clear of construction areas to prevent damage. No items shall be installed that are permanently damaged or flawed. All minor repairs, if necessary, will be done to the site improvement items prior to project completion at the expense of the contractor.

END OF SECTION 02800

SECTION 02810 - UNDERGROUND IRRIGATION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, including General and Supplementary Conditions, and Division 1 - General Requirements and Conditions, shall apply to the work under this section.

1.2 WORK INCLUDED

A. The Landscape Contractor (LC) shall provide all labor, materials, necessary equipment and services to complete the Underground Sprinkler System work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

B. Protection of Public Property: The LC shall, at all times, protect all materials and work against injury from any cause, and shall provide and maintain all necessary guards for the protection of the public. The LC shall be held responsible for any damage or injuries to persons or property, which may occur as a result of his/her fault or negligence during the execution of the work. The LC shall insure that his work does not interrupt established or projected drainage patterns.

C. The completed and proper construction of the landscape irrigation system including, but not limited to:

1. All piping, including mains, laterals, fittings, sleeves, connections, tees, risers, clamps, and swing joints.

2. All control, gate, globe, pressure reducing, quick coupling and other valves; including valve boxes, markers, connections, operators and other accessories.

3. Connection to automatic control system as shown on plans, including control wiring low voltage connections and electrical and communication wire connections, conduit, and coordination of 120V electrical.

4. All rotating and stationary spray and bubbler sprinkler heads; including proper nozzles as called for herein and shown on the plans and all other appurtenances and accessories for proper operations.

5. Connection of piping to the supply sources as shown on the plans.

6. All excavation, site work, relocation or replacement of utilities, backfill, compaction and restoration of all disturbed areas.

7. The contractor shall be responsible for providing a complete and operable

system for the irrigation of all areas to be landscaped on the project site. The plans and these specifications are intended to include all items obviously necessary and requisite for the proper irrigation of the project. This in no way relieves the contractor of his responsibility to furnish any additional labor, materials and equipment required for a proper system.

8. The contractor shall be responsible for adjusting head location, type and size, and any other system components to comply with the requirements of landscaping as actually intended. Such adjustments shall be made at no cost to the Owner except for, when authorized in writing, such adjustments which will be compensated at an agreed upon price.

9. The contractor shall supply, deliver, store, and protect all equipment and materials including pipe and fittings, sprinkler heads, valves, controllers, wire, and all other component parts necessary for the installation of a fully automatic irrigation system as indicated in the plans and specifications. Adequate security of materials on site shall be provided by the contractor at all times at his expense.

D. Explanation of Drawings:

1. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, sleeves, etc. which may be required. The contractor shall carefully investigate the structural and finish conditions affecting all of the work and plan his work accordingly, furnishing such offsets, fittings, and sleeves as may be required to meet such conditions.

2. The drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, underground utilities, plantings, and architectural features. Deviations shall be brought to the Landscape Architect's attention.

3. All work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications.

4. The contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been known in engineering. Such obstructions or differences should be brought to the attention of the Landscape Architect. In the event that notification is not performed, the contractor shall assume full responsibility for any revision necessary.

5. Explanation of Drawings: Conflicts between the plans, notes, details or specifications shall be immediately brought to the attention of the Landscape Architect. These discrepancies or conflicts shall be interpreted by the Landscape Architect and his decision shall be final in all cases. Should the contractor fail to notify the Landscape Architect of the

conflict(s) and by so, take advantage of the said discrepancy, the Contractor shall be held responsible for making any and all changes as directed by the Landscape Architect with no compensation for extra labor, material or equipment.

6. The contractor shall prior to trenching, verify the location of all underground utilities as are commonly encountered underground. He shall take proper precaution not to damage or disturb said improvements.

7. If, in the opinion of the Landscape Architect, the labor furnished by the contractor is incompetent, unskilled, or unreliable, his equipment inadequate, improper or unsafe, or if the contractor shall fail to continuously and diligently execute the construction, the Landscape Architect or Owner shall, in writing, instruct the contractor to remove all such causes of noncompliance and the contractor shall promptly comply.

8. The contractor shall be responsible for full and complete coverage of all irrigation areas. The Landscape Architect shall be notified of any necessary adjustments to the irrigation system. Any revisions to the irrigation system must be submitted and answered in written form, along with any change in contract price.

E. On-Site Conditions:

1. Inspection of the Site: The contractor shall acquaint himself with all on-site conditions. Should utilities not shown on the drawings be found during excavations, the contractor shall promptly notify the Owner for instructions as to further action. Failure to do so will make the contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities not shown on the drawings.

2. Protection of Property: The contractor shall be responsible for the preservation and protection of all site conditions to remain from damage due to this work. In the event damage does occur, all damage shall be completely repaired to its original condition at no additional cost to the Owner.

3. Trenching: All trenching or other work under the leaf canopy of any and all trees shall be done by hand or by other methods so that no branches are damaged in any way.

   Trenching around existing plant material shall be done by hand so as to minimize root disturbance.

   Building, walks, walls, and other property shall be protected from damage. Open ditches left exposed shall be flagged and barricaded by the contractor by approved means. The contractor shall restore disturbed areas to their original condition.

4. Protection and Repair of Underground Utilities: The contractor shall be responsible for requesting the proper utility company to stake the exact location of any underground lines including but not limited to electric, gas, telephone, water and cable.

   The contractor shall take whatever precautions are necessary to protect these underground lines from damage. In the event damage does occur, all damage shall be completely repaired to its original condition, at no additional cost to the Owner.

5. Private Utilities: The contractor shall request the Owner, in writing, to locate any private utilities (i.e., electrical service to outside lighting) before proceeding with any excavation. If, after such requests and necessary staking, private utilities, which were not staked, are encountered and damaged by the contractor, they shall be repaired by the Owner at no cost to the contractor. If the contractor damages staked or located utilities, they shall be repaired at the contractor's expense.

F. Change Orders: Any change or substitution in the plans must be negotiated between the LC and the Owner or Owner's Authorized Representative (OAR). Any work performed on changes or 'extras', prior to execution of a written agreement, may or may not be compensated for by the Owner at his discretion.

1.3 RELATED WORK

A. Section 02300 – Earthwork

B. Section 02920 – Grass Sodding

C. Section 02930 – Trees, Shrubs, and Groundcovers

1.4 QUALITY ASSURANCE

A. All irrigation work shall be installed by qualified personnel or a qualified irrigation subcontracting company that has experience in irrigation systems of similar size, scope, main line, system pressure, etc. as is indicated for this project.

B. All applicable ANSI, ASTM, FED, SPEC. Standards and Specifications, and all applicable building codes and other public agencies having jurisdiction upon the work.

C. The contractor shall be responsible for constructing the system in complete accordance with all local codes, ordinances and laws. Any modifications made to conform to said codes, laws and ordinances shall be completed at the contractor's expense with no additional compensation allowed.

D. Protection of Existing Plants and Site Conditions: The contractor shall take

necessary precautions to protect site conditions to remain. Should damages be incurred, this contractor shall repair the damage to its original condition at his own expense. Any disruption, destruction or disturbance of any existing plant, tree, shrub, or turf, or any structure shall be completely restored to the satisfaction of the Owner and his representatives, solely at the contractor's expense.

E. Permits and Fees: Obtain all permits and pay required fees to any governmental agency having jurisdiction over the work. Inspections required by local ordinances during the course of construction shall be arranged as required. On completion of the work, satisfactory evidence shall be furnished to Landscape Architect to show that all work has been installed in accordance with the ordinances and code requirements.

F. Approval: Wherever the terms "approve", "approval", or "approved" are used in the specifications, they shall mean the approval of the Owner or Owner's Representative in writing.

G. The Owner reserves the right to substitute, add or delete any material or work as the work progresses. Adjustment to the contract price shall be negotiated if deemed necessary by the Owner or Owner's Representative and shall be credited or deducted to the contract sum according to the unit prices provided in this proposal.

H. The Owner or Owner's Representative reserves the right to reject material or work, which does not conform to the Contract Documents. Rejected work shall be removed or corrected at the earliest possible time at contractor's expense.

I. Final Acceptance: Final acceptance of the work may be obtained from the Owner upon the satisfactory completion of all work. Acceptance by the Landscape Architect and/or Owner in no way removes the contractor of his responsibility to make further repairs, corrections and adjustments to eliminate any deficiencies which may later be discovered.

J. Guarantee: All work shall be guaranteed for one year from date of acceptance against all defects in material, equipment and workmanship to the satisfaction of the Owner. Repairs, if required, shall be done promptly at no cost to the Owner.

1. The guarantee shall also cover repair of damage to any part of the premises resulting from leaks or other defects in material. The contractor shall not be responsible for work damaged by others. Repairs, if required, shall be done promptly. The guarantee shall state the name of the Owner, provide full guarantee terms, effective and termination date, name and license number of contractor providing guarantee, address and telephone number. It shall be signed by the chief executive of the contractor and notarized. Manufacturer's warranties shall not relieve the contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

K. The contractor shall provide full coverage in all irrigated areas and shall be responsible for additional heads and components as required, installed at his own cost.

L. Contractor shall make necessary adjustments in the layout as may be required to connect to existing stubouts, should such stubs not be located exactly as shown, and as may be required to work around existing work at no increase in cost to the Owner.

M. On-Site Observation: At any time during the installation of the irrigation system by the contractor, the Owner or Landscape Architect may visit the site to observe work underway. Upon request, the contractor shall be required to uncover specified work as directed by the Owner or Landscape Architect without compensation. Should the material, workmanship or method of installation not meet the standards specified herein, the contractor shall replace the work at his own expense.

1.5 SUBMITTALS

A. "As-Built" Irrigation Drawings:

1. Prepare an "As-Built" drawing on reproducible bases which shall show horizontal and vertical deviations from the bid documents made during construction affecting but not limited to the mainline pipe, controller locations, remote control valves, quick-coupling valves and all sprinkler heads. Drawings shall indicate and show approved substitutions of size, material and manufacturer's name and catalog number. All piping shall be dimensioned and drawn to scale. Remote control valves and isolation valves shall have (2) measurements from fixed objects. All zone valves shall be labeled with accurate G.P.M. to establish correct flow zone data to be inserted into irrigation program.

2. Store "As-Built" drawings apart from documents used for construction.

3. Maintain drawings in a clean, dry, legible condition and in good order. Do not use record document for construction purposes.

4. Make documents available at all times for inspection by Landscape Architect or Owner's Representative.

5. Label each document "AS-BUILT" in neat, large, printed letters or by rubber stamp.

6. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.

7. Drawings: Legibly mark to record actual construction and installation, including:

a. Horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements.

b. Field changes of dimensions and detail.

c. Changes made by Field Order or by Change Order.

d. Details not on original Contract Drawings.

8. Specifications and Addenda: Legibly mark each Section to Record changes made by Field Order or by Change Order.

9. Sepia mylar drawings to be used for Record Document submittal may be obtained for a fee from the Landscape Architect. Contractor shall transfer all record documents information outlined above to these reproducible drawings.

10. Prior to contract closeout, the contractor shall deliver the complete set of sepia mylar drawings fully updated and containing the information outlined above to the Landscape Architect for the Owner. Additionally, the contractor shall furnish three (3) blueline copies of "as-built" drawings. These drawings shall be delivered to the Landscape Architect prior to his review for Substantial Completion of the work.

B. Operations and Maintenance Manuals: The contractor shall prepare and deliver to the Landscape Architect/Owner Representative within ten (10) calendar days prior to completion of construction a minimum of three (3) hard cover binders with three rings containing the following information:

1. Index sheet stating the contractor's address and business telephone number, list of equipment with name(s) and address(es) of local manufacturer's representative(s).

2. Catalog and parts sheet on every material and equipment installed under this contract.

3. Complete operating and maintenance instruction on all major equipment.

4. Provide the Owner's maintenance personnel with written and "hands-on" instructions for major equipment and show evidence in writing to the Landscape Architect at the conclusion of the project that this service has been rendered.

PART 2 - PRODUCTS

2.1 GENERAL

A. General: All materials throughout the system shall be new and in perfect condition.

2.2 PIPING

A. The irrigation system pipe shall be as stated herein and shall be furnished, installed, and tested in accordance with these specifications. Unless otherwise stated on the plans, all pipe fittings shall be capable of withstanding a sustained pressure of at least 125 PSI

B. All secondary (circuit) irrigation lines shall be Schedule 40 PVC. Pipe shall be purple or have a purple stripe on top of the pipe. PVC piping used for the reuse water main shall be at least DR-18 or AWWA C900. The PVC piping used for the reuse water main shall have a 14 gauge insulated wire attached to the pipe for use in locating the pipe.

C. All pipe extensions for varied height shrub risers and PVC pipe sleeves under paved areas shall be Polyvinyl Chloride (PVC) Pipe, Schedule 40. Risers shall be painted green.

2.3 PVC PIPE CEMENT AND PRIMER

A. Provide solvent cement and primer for PVC solvent weld pipe and fittings as recommended by the manufacturer.

B. Solvent weld cement shall be Uni-Weld 2400 (Turf-Tite) with primer Uni-Weld 8700 HI ETCH Purple Primer, or approved equal.

C. All solvent weld joints must be primed.

2.4 THREADED CONNECTIONS

A. Threaded PVC Connections shall be made up using Teflon tape or Teflon pipe dope.

B. All connections between mainline pipe fittings and automatic or manual control valves shall be made using Schedule 80 threaded fittings and nipples.

2.5 THRUST BLOCKS

A. Main line piping shall have thrust blocks sized and placed in accordance with the pipe manufacturer's recommendations for all pipe 3” and larger. Thrust blocks shall be a standard poured concrete mix in accordance with ASTM C-150, ASTM C-33, and ASTM C-94 with a compressive strength (28 days) of 2000 PSI. Thrust blocks shall be installed at all tees, elbows, 45's, crosses, reducers, plugs, caps and valves. Contractor shall be responsible to ensure stability of all thrust blocks. No "pre-cast" or "pre-bagged" thrust blocks shall be allowed. Contractor shall protect all pipe joint connections, control wires, communication cables, and power supply wiring, from concrete by approved means.

2.6 PIPE AND WIRE SLEEVES

A. Sleeves to be installed:

1. The contractor shall install irrigation system pipe and wire sleeves conforming to the following:

a. All pipe sleeves shall be of the size indicated on the drawings.

b. All pipe sleeves shall extend a minimum of 24" beyond the edges of pavement.

c. All pipe sleeves shall be PVC Pipe Schedule 40.

d. All pipe sleeves shall be installed at the minimum depth specified for main lines, lateral lines, and electric wire.

e. Contractor shall coordinate all pipe sleeve locations and depths prior to initiating installation of the irrigation system.

2.7 SPRINKLER HEADS

A. Pop-up Spray Heads: Toro 570Z-PRZ as designated on the drawings.

B. Pop-up Rotor Heads: Hunter PGM and I-20 Series as designated on the drawings.

2.8 CONTROLLERS:

A. The irrigation system controller shall be as indicated on the drawings.

B. All controllers shall be equipped with a Mini Clik II rain sensor device.

2.9 ELECTRIC REMOTE CONTROL VALVES

A. The remote control valves shall be Rainbird PEB series valves.

B. All valves shall be tagged with Christy's "Red Hot" irrigation I.D. tags with hot stamped, factory printed numbering and lettering, corresponding to the valve's identification.

2.10 VALVE BOXES

A. In areas which may be subject to vehicle traffic, valve boxes are to be concrete with metal lids. In other areas, valve boxes shall be purple PVC with locking lid. All lids shall be marked "Irrigation Control Valve." Paint interior of valve boxes purple.

B. Acceptable Manufacturers: Ametek 12 inch "Superflexion,"; Tyler 461S; USF 7500.

C. Valve boxes shall be installed flush with finished grade as detailed on the drawings (except in beds, where they shall be installed 3” above finished grade to allow for mulch). Contractor shall assure percolation beneath the valve box by approved methods.

2.11 IRRIGATION CONTROL WIRE

A. All electrical control, common and ground wire shall be irrigation control cable, Type "UF", 600 volt, solid copper, single conductor wire with PVC insulation and bear UL approval for direct underground burial feeder wire.

1. Control wire from independent station controllers to electric valves shall be AWG Size 14/1 (minimum) and shall not be shared between valves.

2. Common and control wires shall not be shared between controllers.

3. Each controller shall have its own separate white common wire.

4. When more than one controller is used the white common wire for each controller shall be color coded with waterproof electrical tape.

5. Colored coded electrical tape shall be used at all valve connections, splices, and at controller.

6. Electrical tape shall be securely fastened to control wires at the required 20' intervals and at all valve connections, splices and at the controller.

Verification of wire types and installation procedures shall be checked to conform to local codes.

7. All wire connections and splices shall be made with 3M DB4 waterproof wire connectors. All wire connections and wire splices shall occur in valve boxes or splice boxes.

PART 3 - EXECUTION

3.1 PREPARATION

A. Layout of Mains and Laterals: Layout sprinkler mainlines and perform line adjustments and site modifications to laterals prior to excavation.

B. Coordinate all installation with landscape planting work, especially fine grading, and soil preparation for planting areas.

C. Coordinate and cooperate with all other contractors to enable the work to proceed as rapidly and efficiently as possible.

D. Layout of Sprinkler Heads: Stake sprinkler head locations and check for

uniformity of coverage and correctness of pattern.

E. Controller, Gate Valve, and Valve Location: Locate to assure ease of access for maintenance and that no physical interference with other elements of the project exist.

F. Furnish temporary support, adequate protection and maintenance of all underground and surface utilities, structures, drains, sewers, and other obstructions encountered in the progress of the work.

G. Contractor shall acquaint himself with all site conditions. Should utilities not shown on the plans be found during excavation, contractor shall promptly notify the Owner for instructions as to further actions. Failure to do so will make contractor liable for any and all damage thereto rising from his operations subsequent to discovery of such utilities not shown in plan.

H. Where the grade or alignment of the pipe is obstructed by existing utility structures such as conduit, ducts, pipe branch connections to sewer mains, main drains, water services, etc., the obstruction shall be permanently supported, relocated, removed or reconstructed by the contractor in cooperation with the Owner of such utility. No deviation from the required line or grade shall be made without the written direction of the Owner's Representative.

3.2 PIPE INSTALLATION

A. The contractor shall stake out the location of each run of pipe, sprinkler heads, and valves prior to trenching.

B. Excavation shall be unclassified and shall include all materials whatsoever encountered in the excavation of trenches for pipe installation. The trench shall be of sufficient width and depth for installation of the pipe as indicated herein. The contractor shall cause minimum disturbances to all existing conditions wherever possible; the contractor shall bore under existing pavement and sidewalks rather than cut and restore. No pavement shall be cut without the Owner's Representative's permission.

C. Pipe shall be delivered and stored on the job site with suitable protection against any damage to pipe and fittings.

D. Trenches shall be made wide enough to allow a minimum of 4 inches between parallel pipe lines. Parallel lines shall not be installed directly over one another. No lateral line shall be made of sufficient depths to provide the minimum cover from finish grade as follows:

1. 18" minimum cover over main lines.

2. 18" minimum cover over control wires from controller to valves.

3. 12" minimum cover over lateral lines to heads.

4. Maintain all warning signs, shoring, barricades, flares and red lanterns as required by the Safety Orders of the Division of Industrial Safety and any local ordinances and codes.

E. The pipe and fittings shall be carefully inspected before installation in the trench. All rocks over 2" diameter and unsuitable bearing material shall be removed from trench in strict accordance with the manufacturer's recommendations.

1. Solvent welded joints shall be made only on clean, dry, square cut, smooth pipe sections. The fittings shall be "dry" tested for proper size before solvent is applied. The assembly shall proceed in strict accordance with recommended procedures furnished by the manufacturer.

2. Solvent welded pipe sections shall be "snaked" from side to side in the trench to prevent joint rupture due to thermal contraction.

3. Pipe openings shall be plugged during construction to prevent entrance of foreign materials.

F. Backfill shall be carefully placed to avoid pipe dislocation. Backfill material shall be free of rocks, stumps, roots and other unsuitable material. In planting areas, the top six inches (6") shall be suitable planting soil. Backfill shall be placed in six inch (6") lifts and shall be thoroughly compacted by mechanical tamping except in planting areas where planting soil is used. Backfill under pavement or sidewalks shall be compacted to 98% of maximum A.A.S.H.O. T-180 density. The surface of backfilled trenches shall be even with the surrounding ground surface.

Plant locations shall take precedence over sprinkler and pipe locations. The contractor shall coordinate the routing of lines and final head locations with the placement of specimen trees and shrubs.

3.3 SPRINKLER HEAD INSTALLATION

A. Contractor shall be responsible for the exact location of all sprinkler heads, acknowledging that the plans are schematic in nature. The contractor shall accordingly place all sprinkler heads, adjust all nozzles, spray patterns, and make whatever other adjustments that may be required to give the landscaped areas full, complete and proper coverage and distribution, and to meet all manufacturer's requirements. The contractor shall make all such adjustments and additions solely at his expense.

B. Sprinkler heads located along curbs and edges of paving shall be installed 6" from back of curb or paving; except along roadways without curbs, sprinkler heads shall be located 12" from edge of pavement.

C. Sprinkler heads shall be installed as designated on the drawings. The top of all sprinkler heads shall be flush with finish grade or top of curb.

D. All sprinkler head risers above finished grade shall be staked with as per drawing and painted with exterior alkyd enamel paint flat black. Contractor shall provide sample of paint to the Landscape Architect prior to installation. Use black UV approved wire ties only.

E. Spacing of heads shall not exceed the minimum indicated on the drawings (unless directed by the Landscape Architect). In no case shall the spacing exceed the maximum recommended by the manufacturer.

F. Before sprinkler heads are set, the contractor shall flush the lines thoroughly to ensure there is no foreign matter in the lines.

3.4 CONTROLLER INSTALLATION

A. Contractor shall be responsible for installing all automatic controllers located on the plans and details for the complete and proper automatic operation of the irrigation system. All such work shall be coordinated with the building and site contractors. Electric control valves shall be connected to controller in a clockwise sequence to correspond with station settings noted on the plans beginning with Stations 1, 2, 3, etc. Electric source shall be provided by others. Contractor shall be responsible for all connections, grounding, hook-ups, materials, labor, etc. for complete automatic operation according to all applicable codes.

The location of all controllers shall be approved by the Owner prior to installation.

3.5 CONTROL WIRE INSTALLATION

A. Install control wires at least 18" below finish grade and lay to the side of the main line. Provide a minimum of 48" of looped wire slack at valves and at 300’ intervals, snake wires in trench to allow for contraction of wires. Tie color-coded wires in bundles at 20' intervals and at changes in direction. The wire shall be laid in the trench prior to the installation of the pipe.

B. All underground wire splices shall be made at electric valves in valve boxes or splice boxes, using waterproof connectors per manufacturer's instructions.

C. All wire passing under existing or future paving or construction shall be encased in Schedule 40 PVC conduit extending at least 12" beyond edges of paving and stabilized for construction.

3.6 VALVE AND VALVE BOX INSTALLATION

A. Gate Valves: Install as located and detailed on the drawings.

B. Electric Control Valves: Shall be installed in specified valve boxes at the depth

specified on the drawings. The valve box shall have 6" layer of 3/4" pea gravel installed below the bottom of the valve. The valve shall be connected to the main line with Schedule 80 PVC extensions as necessary to ensure valve is properly positioned in the valve box as shown in the details. Electric control valves shall be installed where shown and grouped together where practical (NO MORE THAN 2 ITEMS PER SERVICE TEE). The contractor shall place no closer than 3 feet from edges of sidewalks walk edges, buildings and walls and no closer than 7 feet from the back of curb along roadways or centerline of swales. The contractor shall adjust the valve to provide flow rate or rated operating pressure required for each sprinkler circuit.

D. In the event that the valve box does not extend to the base of the electric control valve because of specific field conditions or complications as verified and approved by the Owner prior to installation, the contractor shall provide and install valve box extension(s) as manufactured by Ametek.

3.7 THRUST BLOCK INSTALLATION

A. All main line pipe shall have thrust blocks installed at tees, bends, or at the end of pipe lines as detailed on the drawings. Care shall be taken to install the concrete on the fittings and away from joints of pipe. Control, power and valve wires must be kept free of concrete and placed outside and away from the thrust block. Thrust blocks shall be poured against undisturbed ground as detailed on the drawings. No precast or pre "bagged" thrust block will be allowed.

3.8 PAINT

A. Exterior alkyd enamel, flat black, shall be used on aboveground PVC risers and other designated irrigation equipment. Contractor shall provide paint sample prior to execution of painting.

3.9 TESTING

A. The contractor shall notify Landscape Architect and Owner twenty-four (24) hours in advance of testing.

B. Prior to backfilling of mainline fittings, contractor shall fill the main line piping with water, in the presence of the Owner/Architect, taking care to purge the air from it by operating all the sprinkler control valves one or more times and/or such other means as may be necessary. A small, high pressure pump or other means of maintaining a continuous water supply shall be connected to the Main Line and set so as to maintain 100 PSI in the Main Line system for two (2) hours without interruption. When this has been accomplished and while the pressure in the system is still 100 PSI, leakage testing shall be performed.

Lateral line testing shall be conducted during the operating testing of the system by checking visually the ground surface until no leaks in this portion of the system are evident. Leaks shall be repaired or paid for by the contractor at any time they appear during the warranty period.

C. Adjustment and Coverage of System: Coordinate pressure testing with adjustments and coverage test of system so both may occur at the same time. The contractor shall balance and adjust the various components of the system so that the overall operation of the system is most efficient. This includes a synchronization of the controllers, adjustments to pressure regulators, pressure relief valves, part circle sprinkler heads, and individual station adjustments of the controllers.

D. All items of construction and operation of the irrigation system are subject to the inspection and testing by the Landscape Architect and other representatives of the Owner. Any item may be rejected because of non-compliance with the plans and specifications, non-suitability, poor materials, inadequate workmanship or improper assembly or other causes which would prevent the system from functioning properly, or which in the Landscape Architect's opinion would be detrimental to the longevity of the irrigation system, or which would necessitate excessive manual labor and maintenance.

E. The contractor shall fully comply with the schedule of testing and inspection, as well as any other tests or inspections that may be ordered by the Landscape Architect or other authorized representative of the Owner. All labor, materials, and equipment required for said tests and inspections shall be furnished at the sole expense of the contractor. Work stoppages for testing, inspection and replacement or repair of any inadequate item shall not add to the allocated time of completion.

F. All repairs, replacements, adjustments and reconstruction required to pass said inspections and tests shall be at the contractor's sole expense.

G. Contractor shall be responsible for the full and proper maintenance of the irrigation including but not limited to adjustments, repairs, integration with the master control system, etc. Contractor's responsibility for maintenance (exclusive of replacements or repairs within the guarantee/warranty period) shall terminate on the date of Substantial Completion for the entire project or designated portion thereof as declared by the Landscape Architect according to the conditions of the contract, provided the contractor has provided the Landscape Architect with irrigation 'as-built' drawings, and three (3) copies of Operation and Maintenance Manuals as specified under Paragraph 1.5 of this section.

H. Final inspection shall be made when the complete system is in place, operable, and all repairs, additions, adjustments and other work is complete. At such time, the contractor shall adequately demonstrate the proper operation of the system, shall show the system's complete conformance with the plans and specifications, and demonstrate that the irrigation system gives proper and adequate coverage of all landscaped areas.

I. Final acceptance by the Landscape Architect and/or Owner in no way removes the contractor of his responsibility to make further repairs, corrections and adjustments to eliminate any deficiencies which may later be discovered (includes moving or adding additional sprinklers if needed). Moreover, the contractor shall fully honor the one (1) year warranty outlined herein.

3.10 WARRANTY

A. The contractor shall fully warrant the landscape irrigation system for a period of one (1) year after the written final acceptance and will receive a written confirmation from the Landscape Architect that the warranty period is in effect.

B. During the warranty period, the contractor will enforce all manufacturer's and suppliers warranties as if made by the contractor himself. Any malfunctions, deficiencies, breaks, damages, disrepair, or other disorder due to materials, workmanship, or installation by the contractor and his suppliers shall be immediately and properly corrected to the proper order as directed by the Owner and/or Landscape Architect.

C. Any damages caused by system malfunction shall be the responsibility of the contractor who shall make full and immediate restoration for said damages.

END OF SECTION 02810

SECTION 02826 – METAL GATES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Aluminum gates.

a. Roller gate.
b. Swing gate.

1.2 SUBMITTALS

A. Material Safety Data (MSD): MSD Sheets are required for all materials with detailed information on content, product safety, and potentially harmful characteristics. MSD Sheets shall be submitted by Contractor to the Architect for review prior to delivery or use of such materials on the project site. Product approval will depend, in part, upon meeting the environmental requirements of this specification, based upon MSD information submitted to the Architect for review.

B. Product Data: Material descriptions, construction details, dimensions of individual components and profiles, and finishes for the following:

1. Gates and hardware.

C. Shop Drawings: Show locations gates. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, elevations, gate swing and other required installation and operational clearances, and details of post anchorage and attachment and bracing.

1.3 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

B. Field Measurements: Verify layout information for gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

1.4 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. EDKO; Sugar Grove
2. Hoover Fence

1.5 SWING GATES

A. General: Comply with ASTM F 900 for the following swing-gate types:

1. Single gate.

B. Metal Pipe and Tubing: Aluminum. Comply with ASTM B 429 and ASTM F 1043 for materials and protective coatings.

C. Aluminum Sheet: Flat sheet complying with ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of alloy 5005-H15.

1. Sheet Thickness: Minimum 1/8-inch.

D. Frames and Bracing: Fabricate members from round aluminum tubing with outside dimension and weight according to ASTM F 900 for the following gate fabric height:

1. Gate Height: As indicated.

E. Frame Corner Construction: Welded.

F. Hardware: Latches permitting operation from both sides of gate, hinges, center gate stops. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.

1.6 HORIZONTAL SLIDE GATES

A. General: Comply with ASTM F 1184 for the following slide-gate types:

1. Classification: Type II Cantilever Slide, Class 1 with external roller assemblies.

B. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1083 and ASTM F 1043 for materials and protective coatings.

C. Metal Pipe and Tubing: Aluminum. Comply with ASTM B 429 and ASTM F 1043 for materials and protective coatings.

D. Gates: Fabricate from round aluminum tubing with outside dimension and weight according to ASTM F 1184 for the following gate characteristics:

1. Gate Height: 42-inches, unless otherwise indicated.
2. Gate Opening Width: 10-feet unless otherwise indicated.
3. Counter Balance Width: Not less than 5 feet.

E. Support Posts: Fabricate members from round galvanized steel pipe.

1. Size: 4-inch diameter, unless otherwise indicated.

F. Rollers: Injection molded, 6-inch diameter, nominal 3-inch wide wheels with steel shaft and sealed bearings. Provide with mounting hardware to securely mount to gate.

G. Hardware: Provide mounting hardware appropriate for mounting the swing gate and roller gate system. Fabricate latches with integral eye openings for padlocking nad designed to be accessible from both sides of gate.

1. Hinges for Swing Gate: Heavy-duty, vandal-proof type.

H. Fasteners: Use fasteners fabricated from same basic metal and alloy as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

1. Provide tamper-proof type for exposed fasteners.

1.7 FABRICATION

A. General: Fabricate rolling gates to travel straight and true and to hang plumb.

PART 3 - EXECUTION

1.8 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1.9 INSTALLATION, GENERAL

A. General: Install gates in accordance with manufacturer’s instructions and recommendations.

1.10 GATE INSTALLATION

A. General: Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-proof or concealed means. Adjust hardware for smooth operation and lubricate where necessary.

1.11 ADJUSTING

A. Gate: Adjust gate to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

END OF SECTION 02826

SECTION 02831 – CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Extent of fencing and gates is indicated on drawings and schedules, and by requirements of this section.

1.2 RELATED DOCUMENTS:

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

1.3 QUALITY ASSURANCE

A. Materials and methods of construction shall comply with the following standards and specifications:

1. Chain Link Fence Manufacturers' Institute.
2. American Society for Testing and Materials, (ASTM).

1.4 SUBMITTALS

A. Product Data: Submit complete materials list of items proposed for the work.

B. Certification: For all materials specified to comply with reference standards, submit Certificate of Compliance.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle materials to prevent damage and deterioration.

1.6 COORDINATION

A. Examine Drawings and Specifications for all Contracts to determine the nature of proposed construction. Perform work to conform to construction called for in such a manner as not to interfere or delay work of other Contractors.

1.7 PROJECT CONDITIONS

A. Known underground and surface utility lines are indicated on the drawings.

B. Protect existing trees, plant, lawns, and other features designated to remain as part of the landscape work.

C. Promptly repair damage to adjacent facilities caused by installation operations. Cost of repair at Contractor's expense.

D. Promptly notify the Project Engineer of unexpected conditions.

PART 2 - PRODUCTS

2.1 CHAIN LINK FABRIC:

A. Fabric shall be zinc coated steel wire fabric galvanized after weaving and shall conform to ASTM A392. Fabric shall be 11-½ gauge by 2-3/8 inch mesh. Fabric shall be attached to terminal posts with 3/16 inch by ¾ inch tension bars 7/8 inch by 14 gauge steel tension bands spaced at a maximum of 15-inch intervals. Fabric shall be attached to line post with aluminum tie wire at a maximum of 12-inch intervals. Fabric height is detailed on the Drawings.

B. Fabric Selvages: All fabric shall have twist selvage along the top and bottom of the fabric.

2.2 POSTS:

A. General: All posts shall be hot dipped galvanized inside and out, and shall have tops to exclude moisture.

B. Line posts shall be 2 inch outside diameter standard weight pipe.

C. Gate posts shall be standard weight pipe with outside diameter determined by the following chart:

Opening of Gate	Gate Frame	Gate Posts
Up to 6'-0"	1 5/8 inch diameter	3 inches nominal
6'-1" to 13'-0"	2 inch diameter	4 inches nominal
13'-1" to 18'-0"	2 inch diameter	6 5/8 inches nominal
Over 18'-0"	2 inch diameter	8 5/8 inches nominal

2.3 BRACING:

A. Terminal (end, corner, gate and pull) post shall be braced with 1-5/8 inch outside diameter standard weight pipe, installed midway between top of fabric and ground level, extending from the terminal post to the first line post. Braces are to be attached with malleable rail ends and 7/8 inch by 12 gauge braced bands, securely trussed with 3/8 inch truss rods from the line post back to the terminal post.

2.4 FITTINGS:

A. All fittings shall be of malleable or heavy pressed steel construction. Fittings shall include, but are not limited to, such items as terminal and line post dome caps, end rail caps, brace bands, tension bands, tension board, and stress rods.

2.5 GATES:

A. Gate hinges and locking devices shall be of malleable or heavy pressed steel construction. All gates shall be of welded construction, 11 ½ gauge fabric and shall include drop rods, latches for padlock use, 180 degree hinges, and applicable

cantilevered slide gate wheels, rollers and hardware. Gates 5 feet and higher shall have a horizontal brace, one pipe size smaller. Gates over 8 feet long shall have vertical braces at 8 feet on center maximum, of one pipe size smaller than the main frame. All components used in construction of gates shall be heavily galvanized by the hot dip process, and shall be galvanized after welding of corners. Gate frame galvanizing shall be inside and outside. All single gates shall receive drop rods and latches for padlock attachment.

B. Gate sizes shown on the Drawings are approximate. Gates shall be sized to fit existing field conditions, and sizes shall be noted on shop drawings.

2.6 TOP AND BOTTOM TENSION WIRE:

A. Wire shall be 7 gauge galvanized spring wire, attached to fabric at 24 inches on center with tie wires.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Erect fencing in straight lines between angle points by skilled mechanics experienced in this type of construction. Erect in accordance with the manufacturer's recommendations, Drawings, and these specifications.

B. Hang gates and adjust all hardware so that gates operate satisfactorily from open or closed position.

C. Post Spacing: All posts shall be evenly spaced 10 feet or less on centers and vertically plumb.

D. Post Setting: All posts shall be set in holes of diameter and depth as indicated in the table below. After post has been set and plumbed, the holes shall be filled with concrete mix, crowned to shed water, with minimum compressive strength of 2500 psi at 28 days.

Type Post	Fabric Height	at Top	Hole Diameter Hole Depth	Embedment
Gates	6-10 feet	12 inches	38 inches	36 inches
Line	6-10 feet	9 inches	30 inches	27 inches
Terminal	6-10 feet	12 inches	38 inches	36 inches

3.2 CLEANUP:

A. Upon completion of fencing installation, remove tools and equipment. Provide site clear, clean, free of debris, and suitable for site work operations. Repair any grading irregularities, grassing or landscape damage, or any other site degradation caused by fencing construction activity.

END OF SECTION 02820

SECTION 02910 - TOPSOIL AND PLANTING SOIL PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, including General and Supplementary Conditions, and Division 1 - General Requirements and Conditions, shall apply to the work under this section.

1.2 WORK INCLUDED

A. The Landscape Contractor (LC) shall provide all labor, materials, necessary equipment, services, and facilities to complete the work of this section, as indicated on the drawings, as specified herein or both, except for items specifically indicated as “NIC ITEMS”.

B. The work specified herein includes, but is not limited to:

1. On- or off-site topsoil.

2. Soil conditioners.

3. Planting soil mixes.

1.3 RELATED WORK

A. Section 02300 - Earthwork

B. Section 02810 - Irrigation System

C. Section 02920 - Grass Sodding

D. Section 02930 - Trees, Shrubs, and Ground Cover

1.4 QUALITY ASSURANCE

A. Coordination: The LC shall coordinate with the Landscape Architect (LA) and Owner or Owner’s Authorized Representative (OAR) in monitoring and approval of all items and areas of work required.

B. Reference Specifications and Standards - Requirements or Regulatory Agencies: Conform to applicable requirements of all agencies with jurisdiction over the site.

C. Testing Agencies:

1. The LC shall perform soil-testing services using an Agricultural Testing

Laboratory certified in the State of Florida.

2. Test reports: The LC shall submit all test reports and other certified statements of test analysis in accordance with requirements specified herein.

D. Substitutions:

1. No substitutions will be allowed, unless the LA and OAR is notified and approval by the LA or OAR is received. Written information regarding all substitutions will be required at time of substantial completion.

2. If the specified or detailed materials are not obtainable, the LC shall provide written proposal for use of equivalent material.

E. The LC's Responsibilities:

1. The LC shall furnish all labor, materials, and equipment necessary for the completion of items as shown on the plans and/or specifications.

2. Work shown on the plans and not mentioned in the specifications, or vice versa, shall be done as if shown on both, and should any actual or apparent inconsistencies or errors be found, the LC shall notify the LA as soon as they are discovered and not proceed with any work where such uncertainty exists.

1.5 SUBMITTALS

A. Review and Approval: All submittals shall be submitted by the LC to the LA a minimum of two (2) weeks prior to the installation of any of the materials. The LC shall not begin work until all submittals have been approved by the LA.

B. Certified Soil Testing Laboratory Reports and Recommendations:

1. Soil testing shall be performed by a Soils Testing Laboratory certified in the State of Florida.

2. A total of three (3) separate sets of test reports will be required to be performed and the findings and soil amendment recommendations submitted to the LA and OAR for review as follows:

a. Test report for each of the on-site topsoil samples or off-site topsoil samples.

b. Test report(s) for the proposed planting soil mix(es).

c. Test report for each of the topsoil samples mixed with the planting

soil.

3. Each of the tests shall include the following analyses:

   a. pH range;

   b. Major element analysis: Nitrogen, Phosphorus, Potassium, Calcium, Manganese, and Sulfur;

   c. Minor element analysis: Iron, Zinc, Copper, Boron, and Magnesium;

   d. Soluble-salt concentration;

   e. Sand fraction analysis: Percentage (%) passing one-inch (1"), one-fourth inch (¼"), and No. 200 sieves;

   f. Percolation rate: Inches/hour; and

   g. Organic content: As determined by a loss of ignition test.

4. Testing Laboratory recommendations: Separate soil amendment and fertilizer recommendations for each combined topsoil/planting soil test to address deficiencies and maintain plantings in optimal condition.

5. Each of the test reports shall be identified by project name, date, soil-mix type, and location on the site. The test reports shall be printed on the Testing Laboratory's letterhead and signed by the Testing Laboratory's managing Director.

6. All text shall be legible. Reports submitted by the LC that are not legible will not be accepted as valid submittals.

7. All soil samples and tests shall be submitted to the LA a minimum of one (1) week prior to the delivery of plant materials to the job site. The LC shall be responsible for any delays in maintaining the project schedule, and delivering plants to the job site, if the soil samples and/or tests are found to be inaccurate or incomplete by the LA. All soils shall be amended as required by the specifications and Testing Laboratory's recommendations prior to the commencement of planting.

C. Certificates:

1. Manufacturer's certification and/or Testing Laboratory certification that content of soil conditioners meet specification requirements.

2. Manufacturer's certificate of fertilizer's chemical composition including, but not limited to, percentage and derivation of nitrogen, phosphorus, potassium, and micro-nutrients.

3. Submit all certifications to the LA a minimum of one (1) week prior to delivery of materials to the job site.

D. Soil Conditioner and Proposed Planting Soil Mix Samples: Submit a one (1)-pound sample of each soil conditioner and/or planting soil mix proposed for incorporation into the existing on-site soil.

E. "As-Built" Landscape Drawings: The LC shall prepare, maintain, and submit complete landscape planting "As-Built" documents as stipulated in Section 02930, "Trees, Shrubs, and Ground Cover", Paragraph 1.05, 'Submittals', which shall include written notation of any pertinent soil preparation/soil mix information required for the project.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery of Packaged Materials: The LC shall deliver packaged materials to site in containers in original, unopened containers showing:

1. Weight.

2. Analysis.

3. Name of the manufacturer.

4. Trade name or trademark.

5. Protect from deterioration, contamination, adverse weather, and other damage.

B. Storage:

1. The LC shall deliver approved off-site topsoil (if required) and planting soil mixes in bulk to storage areas designated by the OAR.

2. The LC shall protect bulk delivery materials from deterioration, erosion, contamination, adverse weather, and other damage.

1.7 PROJECT CONDITIONS

A. Existing Conditions:

1. The LC shall examine the project site, verify elevations, observe the conditions under which the work is to be done, and notify the OAR and LA of any unsatisfactory conditions.

2. The LC shall not proceed with work in this section until conditions have been corrected satisfactorily.

3. Utilities:

   a. The LC shall determine location of surface and underground utilities.

   b. The LC shall exercise care in digging and other work so as to not damage existing work including underground cables and pipes.

   c. Should such underground obstructions be encountered, which interfere with his work, the LC shall notify the LA and OAR immediately.

4. The LC shall be responsible for the immediate repair of any damage caused by his work and will be responsible for any disruption of service caused by this damage. Patching and replacing damaged work will be accomplished by the Owner's designated Contractor and the cost of this will be paid by the LC.

5. The LC shall maintain grade stakes set by others until removal is approved by all parties concerned.

6. Excavations: When conditions detrimental to plant growth are encountered, such as rubble fill, road sub-base, adverse drainage conditions, or obstructions, the LC shall notify the LA and OAR prior to planting.

B. Protection: The LC shall protect and maintain, as part of the work of this section, all existing materials.

C. Sequencing and Coordination:

1. Prior to all work, the LC shall coordinate the work of this section with related work of other trades and inform the LA of any scheduling or other discrepancies relating to work to be performed.

2. The LC shall notify the LA of anticipated installation phases and date(s) at least (2) two weeks in advance.

1.8 WARRANTIES

A. Fertilizer:

1. The LC shall affix to each container of fertilizer used in connection with this work, the manufacturer's certified analysis tag or label.

2. Fertilizer analysis shall be:

a. No less than minimum requirements of specifications.

b. As guaranteed by requirements of the Florida State Fertilizer Law.

B. Peat/Humus: The LC shall certify in writing that the peat/humus used meets all requirements and criteria of the specifications.

C. Warranty Conditions: In addition to prior specified warranty conditions, warranties are to cover defects (including death and unsatisfactory growth), except for defects resulting from neglect by Owner, a result of malpractice carried out by the Owner, abuse or damage by others, or unusual phenomena and incidents which are beyond the installer's control.

1.9 METHOD OF MEASUREMENT

A. Quantities: The quantities listed in the Contract Documents are approximate only, and the LC shall verify and furnish all specified materials required to complete the work shown on the drawings and in the specifications.

B. Measurement: Associated products, equipment, and execution necessary, or incidental thereto, will not be separately measured, but will be considered as included in the measurement for trees, shrubs, ground cover, sod, and seed. The only exception will be the provision of off-site topsoil, if approved by the Owner as an additional cost item.

C. Payment: Final payment will be made when the following documents are presented to the Owner:

1. Release of lien: The LC shall furnish the Owner with release of liens from all suppliers, as well as furnishing any liens by subcontractors to the LC doing work on this project. The LC shall provide the Owner with a release of lien prior to final payment.

2. "As-built" drawings: Submitted by the LC and approved by the Owner and LA.

PART 2 - PRODUCTS

2.1 TOPSOIL

A. Source: In the event on-site topsoil does not meet the requirements specified herein, or is available in an insufficient quantity, suitable topsoil shall be imported from off-site sources if approved in writing by the Owner as an additional cost item.

B. Composition: Topsoil shall be suitable for ornamental plant growth and free from hard clods, stiff clay, hardpan, gravel, subsoil, brush, large roots, refuse or other deleterious material, and of reasonably uniform quality.

C. Mechanical Analysis:

1. Topsoil and soil mixture(s) shall meet these specifications and the following mechanical analysis:

Sieve Size	% Passing
1"	99-100
¼"	97-99
#200	less than 7

2. Materials larger than one inch (1") shall be disposed of off the site or as directed by the OAR. Existing leaf litter and plant material shall be excluded from the topsoil with less than 7% of the soil passing the 200 sieve size.

D. Soluble Salts: Maximum amount permitted is 500 ppm.

E. Weeds: The LC shall assure that the topsoil is free of any visible weeds or weed seed.

2.2 SOIL CONDITIONERS

A. Dolomitic Limestone: Approved product, designated for agriculture use.

B. Aluminum Sulfate: Manufacturer’s standard commercial grade.

C. Peat: Suitable for plant growth, capable of sustaining vigorous plant growth, and specifically pulverized for agricultural use. Peat shall be free of deleterious materials that would be harmful to plant growth, shall be free of nematodes, shall be of uniform quality, and shall have a pH value between 5.5 and 6.5 (as determined in accordance with ASTM E-70). Peat shall be sterilized to make free of all viable nut grass and other undesirable weeds.

D. Pesticides: As recommended by applicable Agricultural Public Agencies.

E. Herbicides: As recommended by applicable Agricultural Public Agencies.

F. Soil Fumigants: As recommended by applicable Agricultural Public Agencies.

G. Fertilizer:

1. The LC shall provide a complete commercial-grade fertilizer mixture complying with the laws of manufacture regulating the sale and manufacture of fertilizer in the State of Florida. Chemical designation shall be as specified with at least 50% of the nitrogen derived from a non-water-soluble organic source and all potash to be derived from triple, super phosphate forms for all plantings.

2. The following minor elements shall be included at a minimum:

1.77% Zn
4.00% Mg
0.39% Mn
0.25% Cu
0.52% Fe
0.03% B

3. Minimum percentages shall be verified by the soil test report fertilizer recommendations and revised, if necessary.

4. The chemical designation for granular fertilizer for all plantings shall be 12-8-8, unless otherwise recommended by the Testing Laboratory. The LC shall adjust specified analysis of fertilizer as required, depending upon test results of planting soil(s) and Testing Laboratory's recommendations, at no additional cost to Owner.,

5. See specification Section 02930, "Trees, Shrubs, and Ground Cover" for additional fertilizer requirements.

H. Water: Free of substances harmful to growth of plants. Water shall also be free of staining agents, as well as elements causing odors.

I. Soil Sterilizers: As recommended by State and Local Agriculture Agencies.

J. Planting-Mix Sand: Clean, white, coarse-grained (0.5 mm or greater) sand, free of substances harmful to growth of plants.

K. Gravel: Clean (washed), river run gravel and free from substances harmful to growth of plants. Gravel size shall be graduated percentage consisting of three fourths inch (¾") minimum diameter to two-inch (2") maximum diameter stones.

2.3 PLANTING SOIL MIXES

A. Composition:

1. Planting soil shall be suitable for plant growth and free from hard clods, stiff clay, hardpan, gravel, brush, large roots, nematodes, weed seeds, weeds, refuse or other deleterious material, and of reasonably uniform quality.

2. The LC shall thoroughly blend all planting soil to form a uniform planting medium suitable for exceptional plant growth.

B. Percolation: The LC shall be responsible to assure adequate percolation of all planting pits if adequate percolation cannot be achieved. The LC shall backfill the bottom six inches (6") of each planting pit with approved clean gravel and one (1) layer of soil separator fabric between gravel and soil for increased drainage percolation, if approved by the Owner at an additional cost.

C. Planting Soil Mixes:

1. Annuals and perennials: Planting soil mix to be used for all annuals and perennials shall consist of the following:

a. One-half (1/2) clean, coarse-grained sand.

b. One-fourth (1/4) approved Florida peat.

c. One-eighth (1/8) fine-milled composted pine bark.

d. One-eighth (1/8) vermiculite.

2. Shrubs and ground cover: Planting soil mix to be used for shrubs and ground cover shall consist of the following:

a. One-third (1/3) approved peat.

b. Two-thirds (2/3) approved clean, coarse-grained sand.

3. Trees: Planting soil mix to be placed as backfill around the root balls of all trees shall consist of the following:

a. One-third (1/3) approved peat.

b. Two-thirds (2/3) approved clean, coarse-grained sand.

4. Palms: Planting soil mix to be placed, as backfill shall consist entirely of clean planting-mix sand.

D. Acceptable pH Ranges:

1. All existing on or off-site topsoil and planting soil shall have a pH range of between 5.5 and 7.0. If the tested pH is not within this range, the LC shall consult the Testing Laboratory and recommend to the LA and OAR soil amendments to bring the pH of the soil within the acceptable range.

2. The planting soil mixture for Azaleas, Gardenias, Camellias, and all other plant material specified, which grow best in slightly acidic soil, shall have a pH range between 4.5 and 5.5. In the event that these pH ranges cannot be achieved, the LC shall spread three inches (3") of peat, work into the topsoil to a depth of six inches (6"), creating a 50/50 mixture.

E. Deviation from Control Mix: Not more than 20%. Should a higher degree of variation be found, the LC shall make a correction as directed by the LA and OAR, with conformance tests repeated until the mix meets specifications for pit backfill and soil preparation.

PART 3 - EXECUTION

3.1 INSPECTION

A. Discrepancies: Before proceeding with any work, the LC shall carefully check and verify all dimensions and quantities, and immediately inform the LA and OAR of any discrepancies between the drawings, specifications, and actual conditions. The LC shall not work in any area where there is a significant discrepancy until approval to proceed has been received from the LA.

B. Removal of Debris: The LC shall remove all construction materials and debris from all areas to receive planting soil, without additional expense to the Owner prior to sub-soil preparation.

C. Grading: The LC shall verify that rough grading has been completed and there are no errors that will result in the poor application or cause latent defects in the placement of the planting soil.

3.2 SITE PREPARATION

A. Preparation for Finish Grading:

1. The LC shall prepare the finish grade for trees, shrubs, and ground cover in accordance with the procedure set forth in Section 02930, “Trees, Shrubs, and Ground Cover”, Part 3.02, ‘Preparation’, Paragraph A.

2. The LC shall prepare the finish grade for grass sod in accordance with the procedure set forth in Section 02920, “Grass Sodding”, Part 3.02,

'Preparation', Paragraph A.

B. Finish Grading:

1. The LC shall perform finish grade for trees, shrubs, and ground cover in accordance with the procedure set forth in Section 02930, "Trees, Shrubs, and Ground Cover", Part 3.02, 'Preparation', Paragraph B.

2. The LC shall prepare the finish grade for grass sod in accordance with the procedure set forth in Section 02920, "Grass Sodding", Part 3.02, 'Preparation', Paragraph B.

3.3 PLACING TOPSOIL AND PLANTING SOIL

A. Existing Topsoil:

1. Upon approval of existing topsoil for use on the site, the LC shall place topsoil to the depth specified herein and related specifications.

2. The LC shall spread and smooth topsoil to two inches (2") below finish grade in areas to be sodded. The LC shall remove plant material not indicated as existing, or to be relocated, in order to adhere to sod lines. The LC shall ensure that shrub beds are slightly elevated so that sod does not impound water in the shrub bed.

3. In all parking lot landscape islands, the LC shall completely remove any existing limerock, soil cement, and/or any other construction materials prior to the placement of topsoil.

B. Planting Soil: The LC shall be responsible for providing adequate, acceptable planting soil that meets the requirements specified herein. The LC is responsible for supplying and mixing the soil amendments, transporting, and placing the planting soil in the landscaped areas.

3.4 CLEAN UP

A. Immediately clean up spills, soil, and conditioners on paved and finished surface areas.

B. Remove debris and excess materials from project site immediately.

END OF SECTION 02910

SECTION 02920 - GRASS SODDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, including General and Supplementary Conditions, and Division 1 - General Requirements and Conditions, shall apply to the work under this section.

1.2 WORK INCLUDED

A. The Landscape Contractor (LC) shall provide all labor, materials, necessary equipment, and services to complete the lawns and grass work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as “NIC ITEMS”.

B. Protection of Public Property: The LC shall, at all times, protect all materials and work against injury from any cause, and shall provide and maintain all necessary guards for the protection of the public. The LC shall be held responsible for any damage or injuries to persons or property, which may occur as a result of his/her fault or negligence during the execution of the work. The LC shall insure that his work does not interrupt established or projected drainage patterns.

C. Change Orders: Any change or substitution in the plans must be negotiated between the LC and the Owner or Owner’s Authorized Representative (OAR). Any work performed on changes or ‘extras’, prior to execution of a written agreement, may or may not be compensated for by the Owner at his discretion.

1.3 RELATED WORK

A. Section 02810 - Irrigation System

B. Section 02910 - Topsoil and Planting Soil Preparation

C. Section 02930 - Trees, Shrubs, and Ground Cover

1.4 QUALITY ASSURANCE

A. Coordination: The LC shall coordinate with the Landscape Architect (LA) and OAR in monitoring and approval of all items and areas of work required.

B. Reference Specifications and Standards:

1. Federal Specifications (FS) 0-F-241c (1), Fertilizers, Mixed, Commercial.

2. Testing Agency: Independent Testing Laboratory.

3. Florida Turf Grass Association's (FTGA) established standards.

4. Nomenclature: Conform to names given in "Standardized Plant Names", prepared by the American Joint Committee on Horticultural Nomenclature.

5. Applicable federal, state, or other governing laws and standards as specified hereafter, or as may otherwise apply.

6. Comply with requirements of Section 02910, "Topsoil and Planting Soil Preparation".

C. Source Quality Control:

1. The LC shall ship all landscape materials to the job with appropriate Florida State Department of Agriculture Bureau of Plant Industry Certificates of Inspection.

2. The LC shall provide grass sod grown in a licensed nursery in accordance with standard horticultural practices.

D. Inspection: The LA and OAR reserve the right to inspect grass sod either at place of growth or at the site prior to planting to ascertain compliance with requirements for name, variety, size, and quality. Any grass sod that is not in compliance shall be removed and replaced at the LC's expense.

E. Substitutions:

1. No substitutions will be allowed by the LC, unless the LA and OAR are notified in writing and approval by the LA or OAR is received. Written information regarding all substitutions will be required at the time of substantial completion.

2. If the specified or detailed landscape materials are not obtainable, the LC shall provide a written proposal for use of equivalent material.

1.5 SUBMITTALS

A. Review and Approval: All submittals shall be submitted by the LC to the LA a minimum of two (2) weeks prior to the installation of any of the materials. The LC shall not begin work until all submittals have been verified by the LA.

B. Installation Schedule: The LC shall submit for approval a Planting Installation Schedule to the LA and OAR showing dates for installing the grass sodding in each area of the site.

C. Certificates:

1. Sod Grower Data: The LC shall submit to the OAR at the time of sod

delivery the following:

a. Name(s) of the sod grower(s) and location(s) from which the sod is to be obtained;

b. Verification of grass sod species; and

c. Provide Florida State Department of Agriculture, Bureau of Plant Industry inspection certificates Growers Certification.

2. Manufacturer's certification of fertilizer and herbicide composition.

D. Soil Analysis Test Reports: The LC shall submit the soil laboratory's test findings and recommendations in accordance with Section 02910 "Topsoil and Planting Soil Preparation".

E. "As-Built" Drawings: The LC shall be required to prepare, maintain, and submit complete "As-Built" Landscape Planting drawings as stipulated in Section 02930, "Trees, Shrubs, and Ground Cover", Part 1.05, 'Submittals', which shall include all grass sodding "as-built" information.

F. Warranties, Certificates, and Inspection Tags:

1. The LC shall submit warranties, certificates, and inspection tags for all products and materials as defined under Section 02930, "Trees, Shrubs, and Ground Cover", Part 1.08, 'Warranties'.

2. The LC shall submit certificates of inspection for all materials and products subject to state or federal governmental inspection. Submit certification of compliance of sod type and quality with specifications.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. The LC shall time delivery so that sod will arrive at site within twenty-four (24) hours after being stripped.

2. The LC shall deliver sod on pallets.

3. The LC shall protect sod against dehydration, contamination, heating, and breaking during transportation and delivery.

4. The LC shall not deliver more sod than can be installed within twenty-four (24) hours.

5. The LC shall keep stored sod moist and under shade, or covered with

moistened burlap.

6. The LC shall not pile sod more than two feet (2') deep.

7. The LC shall not tear, stretch, or drop sod.

1.7 PROJECT CONDITIONS

A. Existing Conditions:

1. The LC shall examine the project site, verify elevations, observe the conditions under which the work is to be done, and notify the OAR and LA of any unsatisfactory conditions.

2. The LC shall not proceed with work in this specification until conditions have been corrected satisfactorily.

3. Utilities.

a. The LC shall determine location of surface and underground utilities.

b. The LC shall exercise care in digging and other work so as to not damage existing work including underground cables and pipes.

c. Should such underground obstructions be encountered which interfere with his work, the LC shall notify the LA and OAR immediately.

d. The LC shall be responsible for the immediate repair of any damage caused by his work and will be responsible for any disruption of service caused by this damage. Patching and replacing damaged work will be accomplished by the Owner's designated Contractor and the cost of this will be paid by the LC.

4. The LC shall maintain grade stakes set by others until removal is approved by all parties concerned.

5. Excavations: When conditions detrimental to plant growth are encountered, such as rubble fill, road sub-base, adverse drainage conditions, or obstructions, the LC shall notify the LA and OAR prior to grass sodding.

B. Protection:

1. The LC shall protect and maintain, as part of the work of this section, all existing plant materials designated to remain.

2. When requested by the OAR, the LC shall erect signs and barriers against vehicular traffic.

C Sequencing and Coordination:

1. Prior to all grass sod work, the LC shall coordinate the work of this section with related work of other trades and inform the LA of any scheduling or other discrepancies relating to work to be performed.

2. The LC shall notify the LA of anticipated installation date(s) at least (2) two weeks in advance of installation.

3. Prior to the starting of grass sodding, the LC shall verify that the underground sprinkler system and finish grading have been approved. Unless specified otherwise, do not commence planting until:

   a. Site grading, soil import, and preparation has been completed and approved.

   b. Substantial provision for irrigation or hand watering has been provided to maintain grass sodding.

4. The LC shall proceed with and complete the grass sodding work as rapidly as portions of the site become available, or as otherwise directed.

5. The LC will protect all materials and work against injury from any cause and will provide and maintain all necessary safeguards for protection of the public. The LC will be held responsible for any damage or injury to person or property that may occur as a result of his/her negligence in the prosecution of the work.

1.8 WARRANTIES

A. Grass Sod:

1. All grass sodding shall be established or exhibit signs of being established within thirty (30) days or less from the date of installation, or the grass sod shall be removed and replaced at no additional cost to the Owner.

2. All sodding initially installed by the LC shall be warranted in writing for a period of six (6) months from the date of Final Acceptance.

3. Replacement grass sod under this warranty shall be guaranteed for twelve (12) months from the date of installation.

B. Replacements:

1. At any stage of the planting installation operations, or during the warranty

period, any grass sod covered under this contract that is dead or showing indication of probable non-survival or lack of health and vigor, or which does not exhibit the characteristics and conditions, such as to still qualify for the minimum grade as originally specified, will be promptly replaced by the LC. Replacement grass sod shall be installed by the LC as soon as possible and maintained per the specifications for the planting of new plant material, as well as warranted, as specified above, for new plant material.

2. The LC shall perform all necessary watering, over and above that provided by the automatic irrigation system, which is necessary to establish replacement material.

3. Cost of repair for damage caused by the LC to items including, but not limited to, other plants, curbing, walks, roads, etc. will be the responsibility of the LC.

4. The LC shall coordinate replacements with the LA and OAR.

5. The LC shall make grass sod replacements during the growth season following the end of the warranty period, or as otherwise mutually agreed with the Owner.

6. The LC shall furnish and plant grass sod replacements that comply with all requirements indicated and specified for original material.

7. The LC shall replace grass sod that is in doubtful condition at the end of warranty period, unless the Owner finds it advisable to extend warranty period.

1.9 METHOD OF MEASUREMENT

A. Quantities: The quantities given in the plant list are approximate only, and the LC shall verify, furnish, and plant all grass sod required to complete the work shown on the drawings and in the specifications at no additional cost to the Owner.

B. Measurement:

1. Grass sod will be measured by the square foot, complete and in place. The types and sizes of plant material will be measured separately.

2. Associated products, equipment, and execution necessary or incidental thereto will <u>not</u> be separately measured, but will be considered as included in the measurement for grass sod.

C. Payment: Final payment will be made when the following documents are presented to the Owner:

1. Release of lien: The LC shall furnish the Owner with release of liens from all suppliers, as well as furnishing any liens by subcontractors doing work on this project. The LC shall provide the Owner with a release of lien prior to final payment.

2. The LC shall be required to prepare, maintain, and submit complete “As-Built” Landscape Planting drawings as stipulated in Section 02930, “Trees, Shrubs, and Ground Cover”, Part 1.05, ‘Submittals’, which shall include all grass sodding “as-built” information.

3. Written warranty.

PART 2 - PRODUCTS

2.1 LAWNS AND GRASSES

A. Sod Material:

1. Species: As designated on the drawings and specified below:

a. Stenotaphrum secundatum ‘Floratam’, St. Augustine Floratam.

2. Thatch: Maximum three-eighths inch (3/8”), uncompressed.

3. Other: Uniform in color, leaf texture, and density.

B. Quality:

1. Grass sod shall be freshly cultivated, well-rooted, living sod from an approved source, not stretched, broken or torn, and free from weeds, disease, insects, clover, and crabgrass and recently mowed to three-inch (3") minimum length.

2. Grass sod shall be of high-quality in accordance with standards established by the FTGA.

C. Size: Furnished in pads:

1. Length: Twenty-four inches (24") plus/minus five percent (±5%).

2. Width: Eighteen inches (18") plus/minus five percent (±5%).

3. Thickness: One and one-half inches (1½") excluding top growth and thatch.

2.2 WATER

A. Water shall be free of substances harmful to plant growth.

2.3 FERTILIZER

A. FS 0-F-241c (1), Grade A or B.

B. The chemical designation shall be 12-8-8, with at least 50% of the nitrogen from a non-water-soluble, organic source.

2.4 HERBICIDES

A. As recommended by the State Department of Agriculture.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before proceeding with any work, the LC shall carefully check and verify all dimensions and quantities, and immediately inform the LA and OAR of any discrepancies between the drawings, specifications, and actual conditions. The LC shall not do work in any area where there is a significant discrepancy until approval to proceed has been received from the LA.

B. The LC shall verify that rough grading has been completed and there are no errors that will result in poor application or cause latent defects in fine grading and sodding.

C. The LC shall accept job site elevations at plus/minus two/tenths (±0.2) of a foot from finish-grade elevations.

D. The LC shall verify that approved soil mix and/or soil amendments have been spread and thoroughly incorporated into the existing soil.

3.2 PREPARATION

A. Preparation for Finish Grading:

1. Weeding: Before and during preliminary and finish grading, the LC shall dig out all weeds and grasses by the roots and dispose of off-site. Perennial weeds and grasses, and noxious or invasive weeds, encountered on the site shall also be removed.

2. The LC shall loosen rough-graded material by roto-tilling to a depth of four inches (4") to six inches (6") and re-grade by hand raking to maintain proper elevation.

3. The LC shall remove all stones over two inches (2") in size, rubbish, and

all other extraneous matter from rough grade before beginning finish grading.

4. The LC shall till fertilizer into top two inches (2") of soil at a rate of twelve (12) pounds/1,000 square feet.

5. The LC shall grade around building shall be sloped away at not less than one-fourth inch (¼") per foot, unless otherwise specified.

6. The LC shall slope grass sod areas for positive drainage. When grass sodding is adjacent to buildings, curbs, pavement, or other water-holding obstruction, grade these areas before planting to create positive surface drainage away from plants and buildings.

7. The LC shall direct surface grading to facilitate drainage runoff of water as specified on the plans. The LC shall fill low spots with the specified planting soil mixture.

8. The LC shall remove and disposal of stumps, roots, logs, and other organic, cementitious, or metallic debris not suitable for ease of planting to a depth of not less than twelve inches (12").

B. Finish Grading:

1. The LC shall grade all grass sod areas to a smooth, even, and uniform plane with no abrupt change of surface to establish the correct finish grade.

2. Leveling:

a. The LC shall level out all undulations and irregularities in the surface resulting from tillage, fertilizing, liming, or other operations. Top of base of blade should be flush with pavement.

b. Finish grade of all grass sod, after laying, shall not be higher than adjacent paving, curbs, yard boxes, and other on-grade elements of site development. All surfaces shall drain to drainage devices provided without puddling or ponding. Finish grade must be approximately two inches (2") below pavement surface, top of curbs, etc., or as dictated by grass sod type so that top of base of blade is flush with pavement, curbing, etc.

3. The LC shall provide positive surface drainage in all areas.

a. The LC shall not work soil when moisture content is so great that excessive compaction will occur, nor when it is so dry dust will form in the air.

b. The LC shall apply water, if necessary, to provide ideal moisture for filling and for planting as herein specified.

c. The LC shall properly grade low spots and pockets to drain to established drainage structures.

4. Elevation of finish grade in all areas adjacent to pavement shall be two inches (2") below grade of pavement when all work including grass sodding has been completed.

5. The LC shall be provided with a complete copy of the civil construction documents for his use in reviewing existing grading and to use in restoring the areas impacted by their work. The LC is to contact the Owner for the plans.

6. The LC shall re-establish grade levels where settlement, erosion, or other grade changes occur from the point in time when the respective area is turned over to the LC. This LC shall adjust grades, as necessary, to provide positive drainage.

7. Prior to grass sodding, the LC shall clear the surface of all stones and other objects, larger than one inch (1") in thickness or diameter, and all roots, weeds, brush, wire, and any other objects that might be a hindrance to maintenance operations.

3.3 PLANTING

A. General:

1. The extent of the grass sod work shall be verified by the LC in the field. Additional grass sod required will be adjusted utilizing square-footage unit pricing approved by the Owner prior to the commencement of the work.

2. The LC shall not perform any work until all operations involved with the installation of the sprinkler system serving the areas to be sodded has been completed and is operational, final grades have been established, and the grass sod areas have been properly graded and approved.

3. The LC shall not sod areas until the planting of trees, shrubs, and other plants are sufficiently completed in that area to eliminate the possibility of incurring damage to the lawn areas by tree and shrub planting operations.

B. Sodding:

1. The LC shall pre-water soil to wet it to a depth of two inches (2"). Soil should be damp, but not muddy.

2. The LC shall lay grass sod within twenty-four (24) hours after delivery to

site and within forty-eight (48) hours after being cut. The LC shall not expose sod to sun longer than necessary.

3. The LC shall roll out grass sod or lay squares (preferably 12"x24") carefully. The LC shall use a 2”x4” laid on its side as a “kicker” to butt against sod strips and force them into place. The LC shall fit the grass sod squares together tightly so that no joints are visible.

4. The LC shall lay the first row of grass sod in a straight line with the long dimension of pads parallel to slope contours. The LC shall stagger or offset all joints between grass sod sections. The LC shall butt side and end joints, but not stretch or overlap grass sod.

5. The LC shall peg grass sod on slope ratio of 1:3 or greater with minimum of two (2) stakes per square yard. The LC shall be responsible for stabilizing grass sod at no additional cost to Owner. The LC shall begin sodding at the bottom of slopes and any grass sod parallel to the direction of any slopes.

6. Cut grass sod with a sharp knife or spade to conform to walks, planter beds, header boards, and other characteristics.

7. Roll grass sod with a roller weighing no more than one-hundred-fifty (150) pounds per linear foot of roller width and bring new grass sod into close contact with the soil by thorough rolling.

8. Bring grass sod edge in a neat, clean manner to the edge of all paving and bed line areas. Grass sod shall be one and one-half inches (1½") to two inches (2") below pavement elevations.

9. After laying and rolling grass sod, water area thoroughly and deeply.

   a. Keep grass sod well watered during the first two (2) weeks after installation to insure good rooting into base soil.

   b. Supplement watering from irrigation system by hose, as necessary, to assure adequate water to berms and other critical areas to establish grass sod.

10. The LC shall apply granular fertilizer 16-4-8 at the manufacturer’s recommended rate five (5) days after planting.

11. The LC shall not lay grass sod within four feet (4') of existing tree trunks.

3.4 LAWN ESTABLISHMENT AND REQUIRED MAINTENANCE

A. Watering:

1. The LC shall keep grass sod moist during first week after planting.

2. After first week, the LC shall supplement rainfall to produce a total of two inches (2") per week for approved grow-in period.

B. Mowing and Edging:

1. The LC shall mow grass sod as required until Final Acceptance between two and one-half inches (2½") and three inches (3") height.

2. The LC shall not cut off more than 40% of the grass leaf in a single mowing.

3. The LC shall remove all grass clippings.

4. Edging: The LC shall neatly edge and trim around all plant beds, curbs, roadways, sidewalks, streets, trees, and plants. The LC shall maintain shapes and configurations of plant beds as shown on the landscape plans. The LC shall maintain clean, trenched edge between sod and mulch areas. The LC shall take care not to injure tree trunks or plant materials during the edging operation.

B. Weed Eradication: Between 2nd and 3rd mowing, the LC shall apply herbicide specifically recommended for the grass species uniformly at the manufacturer's recommended rate.

C. Fertilizer:

1. The LC shall apply fertilizer uniformly at the manufacturer's recommended rate two (2) days after grass sodding.

2 .The LC shall provide fertilizing applications as prescribed by agricultural soils, laboratory tests, and recommendations.

D. Adjustment:

1. The LC shall re-sod areas, where necessary, for full and even coverage.

2 The LC shall re-grade, lightly compact, and re-plant around sprinkler heads, where necessary, to maintain proper vertical positioning in relation to general grade.

3. The LC shall fill all depressions and eroded channels with sufficient soil mix to adjust grade to assure proper drainage. The LC shall compact lightly and re-plant the filled areas in accordance with the contract requirements.

4. In the event that weeds or other undesirable vegetation becomes

prevalent, it shall be the LC's responsibility to remove them.

5. Damage resulting from erosion, gullies, washouts, or other causes will be repaired by the LC by filling with topsoil, tamping, re-fertilizing, and re-sodding by the LC.

E. Acceptance: The LC shall produce a good strand of grass sod, acceptable to the LA and OAR, and shall maintain these areas until Final Acceptance. Damaged or unsatisfactorily sodded areas shall be re-sodded to the Owner's satisfaction.

3.5 CLEAN UP

A. Clean Up:

1. During landscape work, the LC shall store materials and equipment where directed. The LC shall keep pavements clean and work area in an orderly condition.

2. The LC shall keep all planted areas free of debris and insects. The LC shall cultivate, weed, and water until Substantial Completion of the work.

3. Upon completion of the grass sod work, the LC shall remove all excess subsoil, cordage, wrappings, and other extraneous materials from the site. The LC shall remove all tools, equipment, and other materials, except those necessary for maintenance work. The LC shall remove litter or other debris occurring from installation and maintenance operations on a daily basis.

3.6 SUBSTANTIAL COMPLETION

A. Procedure:

1. Review of the entire project shall be made upon written request to the LA and OAR from the LC. The written request for review shall be accompanied by the LC's list of items remaining to be completed or corrected.

2. If the site inspection discloses that all work is satisfactory and complete according to the conditions of the contract, the LA and OAR shall declare the work substantially complete.

3. If it is determined by the LA that the Contractor's work is not substantially complete, the LC shall be responsible to compensate the Owner for the additional time required by the LA and OAR to re-inspect the work. Compensation shall be based on the actual time expended according to their respective standard hourly rates.

3.7 FINAL ACCEPTANCE

A. Procedure:

1. When all outstanding substantial completion work items are completed, an inspection will be held to determine acceptability. The LC shall notify the OAR and LA in writing, at least five (5) business days prior to anticipated inspection date, and make arrangements for the inspection at a time and date convenient to all parties.

2. Prior to final approval of work, the LC shall perform the following:

   a. Re-sod areas where necessary for full and even coverage.

   b. Remove all debris from landscape areas.

   c. Re-grade, lightly compact, and re-plant around sprinkler heads, where necessary, to maintain proper vertical positioning in relation to general grade.

   d. Fill all depressions and eroded channels with sufficient soil mix to adjust grades to assure proper drainage, compact lightly, and re-plant the filled areas in accordance with drawing requirements.

   e. Perform any other operations necessary to complete maintenance and ensure that the grass sod areas are healthy, vigorous, visually-pleasing, and undamaged.

3. Upon review of all grass sodding operations, the OAR and the LA shall approve or disapprove the Final Acceptance of the LC's work in writing. Partial Final Acceptance may be given to the LC, at the OAR's discretion, providing the unacceptable work is corrected immediately thereafter.

4. If the grass sodding work is in whole, or substantially acceptable, at the time of the inspection, a written notice will be given stating that the final maintenance period and warranty period begins effective the date of the inspection.

5. After the inspection for Final Acceptance, written acceptance will be given for all work of this section, exclusive of possible replacement of grass sod subject to the warranty. If any deficiencies of requirements exist, they will be noted in writing.

6. Upon written acceptance being given, the Owner will assume all responsibilities for maintenance of the grass sod landscape work.

7. At the conclusion of the warranty period, an inspection will be made to determine the condition of warranted plant material.

   a. Remove all plant material noted as not being in a healthy-growing

condition.

b. At no additional cost, replace plant material during the following planting season with material of like kind and size in accordance with specifications for original planting.

c. The warranty period applies also to replaced material and warranty period will commence upon planting.

END OF SECTION 02920

SECTION 02930 - TREES, SHRUBS, AND GROUND COVER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, including General and Supplementary Conditions, and Division 1 - General Requirements and Conditions, shall apply to the work under this section.

1.2 WORK INCLUDED

A. The Landscape Contractor (LC) shall provide all labor, materials, plant materials, soil additives, equipment, services, and facilities required to complete all landscape planting and related work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as “NIC ITEMS”.

B. Protection of Public Property: The LC shall, at all times, protect all materials and work against injury from any cause, and shall provide and maintain all necessary guards for the protection of the public. The LC shall be held responsible for any damage or injuries to persons or property that may occur as a result of his/her fault or negligence during the execution of the work. The LC shall insure that his work does not interrupt established or projected drainage patterns.

C. Change Orders: Any change or substitution in the landscape work must be negotiated between the LC and the Owner or Owner’s Authorized Representative (OAR). Any work performed on changes or ‘extras’ prior to execution of a written agreement may or may not be compensated for by the OAR at his discretion.

D. The quantities given in the plant list are approximate only. The LC shall verify, furnish, and install all of the plants required to complete the work shown on the drawings and in the specifications at no additional cost Any discrepancies found between the plans and the plant list shall be noted at the bottom of the bid submittal, so that an accurate quantity can be incorporated into the final contract.

1.3 RELATED WORK

A. Section 02300 - Earthwork

B. Section 02810 - Irrigation System

C. Section 02910 - Topsoil and Planting Soil Preparation

D. Section 02920 - Grass Sodding

1.4 QUALITY ASSURANCE

A. Coordination: The LC shall coordinate with the Landscape Architect (LA) and OAR in monitoring and approval of all items and areas of work required.

B. Reference Specifications and Standards:

1. Florida Nurserymen and Grower's Association's (FNGA) established standards.

2. Florida Turf Grass Association's (FTGA) established standards.

3. Florida State Department of Agriculture, Bureau of Plant Industry, 'Grades and Standards for Nursery Plants', latest edition.

4. American Association of Nurserymen, 'Horticultural Standards'.

5. Nomenclature: Conform to names given in 'Standardized Plant Names', prepared by the American Joint Committee on Horticultural Nomenclature.

6. Applicable federal, state, or other governing laws and standards, as specified hereafter, or as may otherwise apply.

7. Comply with requirements of Section 02910, "Topsoil and Planting Soil Preparation".

C. Source Quality Control:

1. The LC shall ship all landscape materials to the job with appropriate Florida State Department of Agriculture, Bureau of Plant Industry, Certificates of Inspection.

2. The LC shall provide trees and shrubs grown in a licensed nursery in accordance with standard horticultural practices.

D. Inspection: The OAR reserves the right to inspect plant materials either at place of growth or at the site prior to planting to ascertain compliance with requirements for name, variety, size, and quality. Final approval shall be based upon the in-place inspection. Any plants that are not in compliance shall be removed and replaced at the LC's expense.

E. Substitutions:

1. No substitutions will be allowed unless the LA and OAR are first notified and approval by the LA or OAR is received. Written information regarding

all substitutions will be required at the time of substantial completion.

2. If the specified or detailed landscape materials are not obtainable, provide the LA and OAR with a written proposal for use of equivalent material.

F. Testing Agencies:

1. The LC shall perform soil testing services using an agricultural testing laboratory certified in the State of Florida in accordance with the requirements of Section 02910, “Topsoil and Planting Soil Preparation”.

2. Test reports: The LC shall submit all test reports and other certified statements of test analysis in accordance with requirements of Section 02910, “Topsoil and Planting Soil Preparation”.

G. Landscape Contractor’s Responsibilities:

1. The LC shall furnish all labor, materials, and equipment necessary for the completion of items as shown on the plans and specifications.

2. Work shown on the plans and not mentioned in the specifications, or vice versa, shall be done as if shown on both and should any actual or apparent inconsistencies or errors be found, the LC shall notify the LA and OAR as soon as they are discovered and not proceed with any work where such uncertainty exists.

3. Should any objectionable materials such as old concrete, asphalt, lime rock sub-base, bricks, or other debris be encountered during planting operations, they shall be removed from the site by the LC.

4. The LC is entirely responsible for the work until Final Acceptance.

5. Project supervision: The LC shall have labor crews controlled and directed by an experienced supervisor well-versed in reading blueprints and specifications pertaining to landscape installation and maintenance. **NOTE:** A supervisor shall have current plans and specifications readily available on-site at all times.

1.5 SUBMITTALS

A. Review and Approval: All submittals shall be submitted by the LC to the LA a minimum of two (2) weeks prior to the installation of any of the materials. The LC shall not begin work until all submittals have been approved by the LA.

B. Installation Schedule: The LC shall submit to the LA and OAR for approval a

planting installation schedule showing dates for starting each type of planting in each area of the site.

C. Samples: When required by Part 3.04, 'Field Quality Control', the LC shall submit samples or organic amendments to the LA and OAR accompanied by analytical data.

D. Warranties, Certificates, and Inspection Tags:

1. The LC shall submit warranties, certificates, and inspection tags to the LA and OAR for all products and materials as defined under Part 1.06, 'Warranties'.

2. The LC shall submit certificates of inspection for all materials and products subject to state or federal governmental inspection to the LA and OAR. The LC shall also submit certification of compliance of sod type and quality with specifications.

E. Test Reports and Recommendations: The LC shall provide an analysis of existing soil samples from the site and planting soil supply areas obtained from a certified soils testing laboratory (i.e., signed original copy(s) by testing laboratory only). The LC shall comply with the submittal requirements of Section 02910, "Topsoil and Planting Soil Preparation".

F. Maintenance Instructions: Prior to the end of the maintenance period, the LC shall furnish three (3) copies of written maintenance instructions to the OAR for maintenance of the installed plants throughout their full-growing season.

G. Documentation of Plant Availability: Prior to commencing work and procuring plant material, The LC shall provide the Owner and LA with written documentation that all of the plant materials can be supplied as specified within the timeframe designated by the Owner. The LC shall verify that the nursery sources, quantities, size, and specimen quality for each plant specified can be provided. If specified plant material is not obtainable, the LC shall submit written notice of non-availability together with a proposal to the **LA for an equivalent substitution. Under no circumstances shall any substitutions be made without the prior written approval of the LA.**

H. Schedule to Field Tag Plant Materials: If requested, prior to procuring plant material, the LC shall coordinate and make all arrangements with the LA and OAR to visit the nurseries for the purpose of selecting and tagging the specified plant materials. The LC shall schedule the field visits at times convenient to all parties with reasonable written notice and confirmation provided.

I. Plant Samples: If requested, the LC shall provide three (3) plants of each shrub,

ground cover, or as specified for approval by the LA and to be used as the representative size, specification, and plant type for all plant materials to be installed. Any plant materials that do not conform to the plans, specifications, or approved plant samples shall be rejected.

J. Plant Photographs: If requested, the LC shall provide two (2) sets of representative color photographs of all plant materials specified with a measuring rod included in the photograph. All photographs shall be legible with minimal dark shadows obscuring planting details. Each picture shall have the date electronically imprinted and the source, species, size, and quantity clearly labeled in waterproof ink on the back of each photograph. Photographs shall be provided as part of the documentation of plant availability and prior to scheduling field visits.

K. Fertilizer(s) sources, types, formulas, and application rates.

L. Plant samples and/or photographs (if requested).

M. Drainage gravel sample (if specified).

N. Samples of mulches, specified herein.

O. Guying methodologies. If necessary. Provide manufacturer's product literature, if different from that specified.

P. "As-Built" Record Landscape Planting Drawings:

1. The LC shall prepare "As-Built" record drawing(s) on reproducible bases procured from the LA which shall show landscape trees, shrubs, ground covers, annuals, vines, aquatics, sod, etc. The record drawings shall also indicate and show approved substitutions of size, material, and any other deviations from the construction documents.

2. The LC shall store the record drawings apart from documents used for construction.

3. The LC shall maintain the record drawings in a clean, dry, legible condition and in good order. The LC shall not use record documents for construction purposes.

4. The LC shall make the record drawings and documentation of pending changes available at all times for inspection by the LA or OAR.

5. The LC shall label each record drawing and associated document "AS-BUILT RECORD DRAWING" in neat, large, printed letters or by rubber

stamp.

6. The LC shall record information concurrently with construction progress.

7. The LC shall legibly mark the record of actual construction and installation on the record drawings including, but not limited to:

   a. Field changes of dimensions and detail;

   b. Changes made by Field Order or by Change Order;

   c. Details not on original contract drawings; and

   d. Landscape substitutions.

8. Specifications and addenda: The LC shall legibly mark each section to record changes made by Clarification, Field Order, and/or Change Order.

9. "As-Built" record drawings shall be kept updated weekly and shall be reviewed by the LA and OAR during the course of the work. If during the course of the work the record drawings are found substantially incorrect or substantially behind the progress of the work, the OAR shall have the right to hold progress payments until said drawings are brought to an acceptable level of completeness.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Preparation for Delivery:

1. The LC shall prune head and/or roots of all trees only under the direction of the LA, and as required to assure safe loading, shipment, and handling without damaging the natural form and health of the plant. In no case are trees to be topped.

2. Prior to delivery to site, the LC shall spray all trees for insects, fungus, and with a foliar anti-transparent. The LC shall deliver plant materials with foliage, limbs, trunk, and roots free of disease and pests.

3. Balled and Burlapped (B&B) plants:

   a. The LC shall dig and prepare for shipment in a manner that will not damage roots, branches, shape, and future development after replanting. Oak trees shall be root pruned thirty (30) days prior to digging and hardened off at the supplier's nursery under mist for

thirty (30) to sixty (60) days.

b. The LC shall ball trees with firm, natural balls of soil. Dry, cracked, or broken rootballs before or during planting operations will not be accepted.

c. The LC shall wrap rootballs firmly with burlap or strong cloth and tie ANSI Z-60.l. Burlap shall be all-natural burlap only, without any synthetic material.

B. Delivery:

1. Packaged materials: The LC shall deliver packaged materials to site in original, unopened containers showing:

a. Weight;

b. Analysis;

c. Name of manufacturer;

d. Trade name or trademark; and

e. The LC shall protect from deterioration, contamination, adverse weather, and other damage.

2. Plant materials: Upon delivery at the site, all plants shall conform to specifications and be checked for handling damage by the LC. Any required inspection certificates, tags, or labels shall accompany each shipment and shall be provided to the OAR and LA by the LC.

3. Planting soil mix and mulch: The LC shall deliver planting soil mixes and mulch in bulk with manufacturer's guaranteed mix, name, and conformance to State law. The LC shall store these materials in designated areas approved by the OAR.

C. Storage:

1. The LA shall protect plants upon arrival on-site from drying or possible injury.

2. The LC shall thoroughly water and properly maintain until planting.

3. The LC shall not allow plants to remain unprotected for a period exceeding four (4) hours. The LC shall store plants in the shade and

protect them from weather. The LC shall heal in trees and palms in a vertical position so that the tree canopy or fronds are not touching the ground.

D. Handling:

1. The LC shall exercise all methods customary in good and standard horticultural practices. The LC shall not drop plants nor use chains or cables on any trees or Palms. The LC shall handle trees using nylon straps with a minimum width of four inches (4").

2. The LC shall remove from the site all plant materials that are not approved, and replace with plant materials that are in accordance with the plans and specifications.

1.7 PROJECT CONDITIONS

A. Existing Conditions:

1. The LC shall examine the project site, verify elevations, observe the conditions under which the work is to be done, and notify the OAR and LA of any unsatisfactory conditions.

2. The LC shall not proceed with work in this section until conditions have been corrected satisfactorily.

3. Utilities:

a. The LC shall determine the location of surface and underground utilities.

b. The LC shall exercise care in digging and other work so as to not damage existing work including underground cables and pipes.

c. Should such underground obstructions be encountered, which interfere with his work, the LC shall notify the LA and OAR immediately.

4. The LC shall be responsible for the immediate repair of any damage caused by his work and will be responsible for any disruption of service caused by this damage. Patching and replacing damaged work will be accomplished by the Owner’s designated contractor and the cost of this will be paid by the LC.

5. The LC shall maintain grade stakes set by others until removal is

approved by all parties concerned.

6. Excavations: When conditions detrimental to plant growth are encountered, such as rubble fill, road sub-base, adverse drainage conditions, or obstructions, the LC shall notify the LA and OAR immediately prior to planting.

B. Protection:

1. The LC shall protect and maintain, as part of the work of this section, all existing plant materials (if applicable).

2. The LC shall verify that all existing trees to remain (if applicable) are properly identified and barricaded to prevent damage by their work under this and future construction. The LC shall be responsible for maintaining adequate identification and barricading of all existing plant material to remain throughout the installation and required maintenance period.

C. Sequencing and Coordination:

1. Prior to all work, coordinate the work of this section with related work of other trades, and inform the LA of any scheduling or other discrepancies relating to work to be performed.

2. The LC shall notify the OAR and LA of anticipated installation phases and date(s) at last (2) two weeks in advance.

3. Prior to the starting of planting, the LC shall verify that the underground sprinkler system and finish grading have been approved. Unless specified otherwise, the LC shall not commence planting until:

a. .Site grading, soil import, and topsoil preparation has been completed and approved.

b. Substantial provision for irrigation or hand watering has been provided to maintain plant materials.

3. The LC shall proceed with, and complete the landscape planting work, as rapidly as portions of the site become available, or as otherwise directed.

4. Coordination with lawns:

a. The LC shall plant trees and shrubs after final grades are established and prior to planting of lawns, unless approved otherwise.

b. When planting of trees and shrubs does occur after lawn work, the LC shall protect lawn areas and promptly repair damage to lawns resulting from planting operations.

5. The LC shall protect all materials and work against injury from any cause and will provide and maintain all necessary safeguards for protection of the public. The LC shall be held responsible for any damage or injury to person or property that may occur as a result of his/her negligence in the prosecution of the work.

1.8 WARRANTIES

A. Shrubs and Ground Covers: The LC shall warrant shrubs and ground covers in writing for a period of one (1) year beyond the date of final acceptance.

B. Trees and Boxed Materials: The LC shall warrant trees and boxed materials in writing for a period of one (1) year beyond the date of final acceptance.

C. Fertilizer:

1. The LC shall affix to each container of fertilizer used in connection with this work, the manufacturer's certified analysis tag or label.

2. Fertilizer analysis shall be:

a. No less than minimum requirements of the specifications.

b. As guaranteed by requirements of the Florida State Fertilizer Law.

D. Peat/Humus: The LC shall certify in writing that the peat/humus used meets all requirements and criteria of the specifications.

E. Warranty Conditions: In addition to prior specified warranty conditions, warranties are to cover defects (including death and unsatisfactory growth), except for defects resulting from neglect by Owner, a result of malpractice carried out by the Owner, abuse or damage by others, or unusual phenomena and incidents which are beyond the installer's control.

F. Replacements:

1. At any stage of the planting installation operations or during the warranty period, any plant material covered under this contract that is dead or showing indication of probable non-survival or lack of health and vigor, or which does not exhibit the characteristics and conditions, such as to still

qualify for the minimum grade as originally specified, will be promptly replaced by the LC. Replacement plants or sod shall be installed as soon as possible and maintained per the specifications for the planting of new plant material, as well as warranted as specified above, for new plant material.

2. The LC shall perform all necessary watering, over and above that provided by the automatic irrigation system, which is necessary to establish replacement material.

3. Cost of the repair for damage caused by the LC to items including, but not limited to, other plants, lawn, curbing, walks, roads, etc. will be the responsibility of the LC.

4. The LC shall coordinate replacements with the LA and OAR.

5. The LC shall make replacements during the growing season following the end of the warranty period, or as otherwise mutually agreed with the Owner.

6. The LC shall furnish and plant replacements that comply with all requirements indicated and specified for original material.

7. The LC shall replace trees and shrubs that are in doubtful condition at the end of warranty period, unless the Owner finds it advisable to extend the warranty period.

1.9 METHOD OF MEASUREMENT

A. Quantities: The quantities given in the plant list are approximate only, and the LC shall verify, furnish, and plant all plants required to complete the work, as shown on the drawings and in the specifications at no additional cost.

B. Measurement:

1. Trees, shrubs, and ground cover will be measured for payment on the basis of each plant installed complete, in place, and accepted. The types and sizes of plant material will be measured separately.

2. Associated products, equipment, and execution necessary or incidental, thereto, will <u>not</u> be separately measured, but will be considered as included in the measurement for trees, shrubs, and ground cover.

C. Payment: Final payment will be made when the following documents are presented to the Owner:

1. Release of lien: The LC shall furnish the Owner with release of liens from all suppliers, as well as furnishing any liens by subcontractors to the LC doing work on this project. The LC shall provide the Owner with a release of lien prior to final payment.

2. "As-built" record drawings: During the course of the installation, the LC shall record all changes made to the plans during installation. These changes shall be documented and provided to the Owner or OAR in accordance with Part 1.03, Paragraph P., of this specification.

PART 2 - PRODUCTS

1.10 MISCELLANEOUS MATERIALS

A. Topsoil: The LC or General Contractor (GC) shall provide topsoil in accordance with the requirements of Section 02910, "Topsoil and Planting Soil Preparation".

B. Planting Mix: The LC shall provide planting soil in accordance with Section 02910, "Topsoil and Planting Soil Preparation".

C. Fertilizer:

1. The LC shall provide a complete commercial fertilizer mixture complying with the laws of manufacture regulating the sale and manufacture of fertilizer in the State of Florida.

2. Agriform tablets: Agriform tablets shall be Agriform twenty-one (21)-gram tablets, slow release, with a chemical designation of 20-10-5, or an approved equal. The LC shall provide as specified below:

a. Trees and palms: Use twenty-one (21) gram Agriform tablets with a chemical designation of 16-10-5. The LC shall follow the manufacturer's recommended application rates, but in no case shall the application rate be less than the following:

One (1) tablet per one-half inch (½") of trunk diameter measured one foot (1') above grade. Planting pit to be backfilled halfway up around the root ball, then equally space the Agriform tablets adjacent to the root ball.

The following minor elements shall be included:

Zn	Cu
Mg	Fe
Mn	B

b. Shrubs and ground covers: Use twenty-one (21)-gram Agriform tablet with a chemical designation of 20-10-5 per the following application rates:

One (1)-gallon container: One (1) tablet.

Three (3)- and five (5)-gallon containers: Three (3) tablets.

Seven (7)-gallon container: Four (4) tablets.

Ten (10)-gallon container: Five (5) tablets.

Backfill halfway up around the root ball, equally space Agriform tablets adjacent to the root ball. The following minor elements shall be included:

Zn	Cu
Mg	Fe
Mn	B

c. Annuals: Backfill mix shall contain slow-release 10-10-10 fertilizer, or fertilizer specifically formulated for use on Annuals.

D. Peat/Humus:

1. Peat shall consist of 90% organic peat and shall be suitable for horticultural purposes.

2. Peat will be brown in color, clean, low in content of mineral and woody material, a pH 4.0 to 5.0, and shall be shredded into particles not larger than one-half inch (½") in diameter.

3. Peat shall contain no more than 35% moisture, the ash content will not exceed 10%, and it shall be free from weedy grasses, sedges, rushes, or mineral matter harmful to plant growth.

E. Mulch for Planting Areas:

1. Top mulch in planting areas shall be free of deleterious materials, debris, insects, and weed seed and shall consist of the following:

a. Eucalyptus: Shredded, loose, substantially free of mineral waste materials, and showing an acid reaction.

b. Cypress mulch: Shredded, Grade B.

c. Pine straw mulch: Baled specifically for horticultural use, free of minerals (rocks), and branches larger than one-fourth inch (¼").

2. Gravel mulch:

a. Gravel shall be clean, washed, and contain no harmful chemicals to plants.

b. Crushed, angular limestone, equally-graduated size between three-fourths inch (¾") to two inches (2"), equal percentage of each size.

c. River washed rock, equally-graduated size between three-fourths inch (¾") to two inches (2"), equal percentage of each size.

F. Dolomitic Limestone:

1. Ground limestone containing not less than 85% of total carbonate and ground to such a size that 50% will pass through a 100-mesh sieve, and 90% will pass through a 200-mesh sieve.

2. Coarser materials will be acceptable, provided the specified rates of application are increased proportionately on the basis of quantities passing the 100-mesh sieve.

G. Aluminum Sulfate: Suitable for horticultural purposes; shall be a recognized-manufacturer's standard, commercial grade.

H. Anti-Desiccant: 'Wilt-Pruf', 'Dowwax', 'Foilgard', or LA / Owner-approved equivalent delivered in manufacturer's containers.

I. Staking Material:

1.Wood stakes, braces, and battens for tree and Palm staking shall be as follows, or approved equal:

a. Construction-grade lumber, pressure-treated Pine.

b. Vertical stakes: Nominal two-inch (2") diameter x eight feet (8') long minimum, pressure-treated wood stakes, and pointed at one (1) end.

c. Braces for Palm trees: Nominal 2"x4"x8' long minimum, pressure-

treated lumber.

d. Anchor stakes: Nominal 2"x4"x3' long, pressure-treated Pine, and pointed at one (1) end.

2 Galvanized-steel plates for Palm trees shall be as follows, or approved equal: Of sufficient size to secure braces to batons with galvanized-wood screws.

3. Tree wrapping shall be as follows, or approved equal: First-quality, heavy, waterproof crepe paper manufactured for tree wrapping, or approved equal.

J. Slope Stabilization:

1. The LC shall be responsible to stabilize grades by approved methods where necessary.

2. The LC shall stabilize all sloped areas greater than 3 to 1 and areas found to be required to reduce surface erosion by the OAR with erosion-control fabric. The LC shall install erosion-control fabric according to the manufacturer's instructions.

K. Soil Filtration Fabric:

1. Soil filtration or separator material shall be used to separate the gravel layer from sub-soil in tree or Palm pits, where percolation may not be adequate (see Part 3.03, 'Preparation', within this section). The fabric shall also be used around perforated underdrains as a 'sock'.

2. The soil filtration or separator fabric shall consist of a sheet of structure composed entirely of preferentially-oriented, isotactic-polypropylene, continuous filaments thermally-bounded mostly at the crossover points and weighing 4.0 +0.3 ounce/yard.

3. Soil separator installation:

a. Roll, size, and overlap as required as indicated, and complete installation as per manufacturer's standard, printed specifications, inspections, and recommendations.

b. The LC shall be responsible for securing top edges of soil separator by an approved method.

L. Drainage Gravel:

1. Gravel shall be crushed, angular limestone.

2. Gravel shall be equally-graduated percentage in size, ranging from three-fourths inch (¾") to two inches (2") in any direction.

3. Gravel shall be installed as shown on drawings or to a minimum of four-inch (4") depth.

4. Gravel shall be washed clean and contain no chemical elements harmful to plants.

5. Drainage gravel shall be provided and installed in the bottom of tree / Palm planting pits where percolation may not be adequate (see Part 3.03, 'Preparation', within this section).

1.11 PLANT MATERIALS

A. Name and Variety:

1. As designated on drawings and plant list.

2. The LC shall provide all plant materials conforming to latest edition of "Horticultural Standards of the American Association of Nurserymen".

3. Names used are those of "Standardized Plant Names".

4. The LC shall attach appropriate identification tags to each plant for all varieties specified as 'patented', 'registered', or 'trade-marked'. The LC shall not remove tags until inspected and approved by the LA.

B. Quality:

1. Unless otherwise specified, all plants shall meet or exceed the 'Florida No. 1' standards in accordance with 'Grades and Standards for Nursery Plants' published by the State of Florida, Department of Agriculture. Plants judged not in accordance with the specified standards will be rejected.

2. Plants designated as specimen shall be 'Florida Fancy' plant material in accordance with 'Grades and Standards for Nursery Plants', published by the State of Florida, Department of Agriculture. Plants judged not in accordance with the specified standards will be rejected.

3. The LC shall provide plant materials that exhibit the following:

   a. Symmetrical, with normal habit of growth, characteristic of the species or variety.

   b. Healthy with well-developed root systems filling their containers, but not to the point of being root-bound. B&B plants shall have vigorous, fibrous feeder roots, visible outside the ball wrap.

   c. Sound, free of mechanical or cultural injury, and free of noticeable effects of disease, insects, eggs, bores, and defects such as knots, sun-scald, windburn, injuries, abrasion, or disfigurement.

C. Dimensions:

1. Measure height and spread of all plants with branches in their normal position. Height and spread dimensions specified refer the to main body of the plant and not extreme branch tip-to-tip. The measurements specified are the minimum acceptable size and are the measurements after pruning, where pruning is required.

2. When dimensions of plant materials are omitted from the plant list, the LC shall provide plants of normal stock for the type listed.

3. The caliper of tree trunks shall be taken one foot (1') above ground level.

4. Trees shall conform to the measurements specified or indicated on the drawings and shall not vary from the size specified more than 10% or have a caliper size which varies more than one-fourth inch (¼"). Where a single trunk is specified, the plant shall have a single, straight trunk for a height of not less than what is specified on the drawings.

D. Trees:

1. The LC shall provide healthy, vigorous stock grown under climatic conditions similar to conditions in the locality of the project and free of disease, insects, eggs, larvae, and defects such as knots, sun-scald, injuries, abrasions, or disfigurement.

2. The LC shall provide trees of the sizes shown and specified. Trees of larger size may be used if sizes of rootballs are increased proportionately, and if accepted by the LA and Owner.

3. Trees, unless otherwise noted, shall be nursery / tree farm-grown. Collected trees will not be accepted.

4. All trees specified as container-grown shall have been grown in a rigid container (grow bags are unacceptable) for a minimum of two (2) years prior to installation.

5. Balled and burlapped (B&B) trees:

   a. B&B trees shall have been root-pruned during the growing season prior to the installation date. The harden-off period shall commence no later than six (6) weeks prior to installation date.

   b. The minimum rootball for B&B plant material is expressed by the caliper-to-rootball diameter ratio. The number is determined by dividing the rootball diameter (inches) by caliper (inches).

   c. The rootball diameter is defined as the average widest portion of the rootball and the measure perpendicular to it. The measure shall be taken within the upper one-third (a) of the rootball.

   d. The caliper shall be measured six inches (6") from the ground on trees up to and including four inches (4") in caliper and twelve inches (12") above the ground for larger caliper trees.

   e. Properly-cured trees shall have visible feeder roots growing through the burlap. Trees delivered to the job site without visible feeder roots shall be subject to rejection by the LA.

   f. Only organic burlap and jute twine shall be used for rootball containment. Synthetic materials (lenomesh) are not acceptable substitutes and are subject to rejection by the LA. After installation, the burlap and twine shall be completely removed from the upper one-third (1/3) of the rootball and disposed of off-site by the LC.

   g. Wire baskets shall only be used during delivery to the job site, and installation and may remain in the plant pit provided the upper one-third (1/3) is removed and disposed of off-site by the LC.

   h. The following chart shall be used to determine the minimum acceptable caliper-to-rootball diameter ratio:

      Caliper-to-rootball ratio (CRB) = RB/C

      Categories:

Container	Caliper	Min. Dia. RB	CRB
7	1.25"	18"	14.4
15	1.50"	20"	13.3
	2.00"	24"	12.0
25	2.50"	28"	11.2
45	3.50"	32"	10.7
65	3.50"	36"	10.3
95	4.00"	40"	10.0
	4.50"	44"	09.8
	5.00"	48"	09.6
200	5.50"	50"	09.1

i. All trees shall be free of low and/or tight “V”-shaped crotches and damage to the trunk.

E. Shrubs and Ground Covers:

1. The LC shall provide shrubs of the sizes shown or specified. Shrubs of larger size may be used if the sizes of the roots are increased proportionately, and if accepted by the LA and Owner.

2. Plants shall have been grown in containers for a minimum of six (6) months and a maximum of two (2) years and shall have sufficient roots to hold soil together after removal from containers. Shrubs shall not be root-bound or have hardened-off root systems.

3. Plants will not be accepted if the body has become too large for the size of the container or if the plant has become root-bound.

4. Plants shall not be removed from the container until immediately before planting.

F. Ball and Burlapped Plants and Wired-Balled and Burlapped Plants: (Only When Applicable.)

1. No plant shall be accepted when the ball of soil surrounding its roots has been cracked or broken, or shows evidence of being ‘made’.

2. The diameter of the rootball must be sufficient to encompass the fibrous and feeding root systems necessary for the maximum development of the plant, and shall conform to sizes and ratios in the table of minimum ball sizes as set forth in 'Grades and Standards for Nursery Plants'.

3. Roots shall have been root-pruned during the growing season prior to the installation date. The hardened-off period shall commence a minimum of six (6) weeks before planting at the job, and such fact shall be certified on accompanying invoices. Where, in the opinion of the LA following an inspection of the grower's stock, adequate root pruning is being obtained by the grower's general cultivating practices, the LC may consider such fact as meeting this requirement, and such fact shall be certified in accompanying invoices.

4. Balls shall be firmly wrapped with burlap, or approved strong cloth. All burlap and approved strong cloth shall be biodegradable.

5. The rootballs of these plants shall be properly protected until planting.

G. Turf Materials:

1.Grass sod: Provide as per Section 02920, "Lawns and Grasses".

PART 3 - EXECUTION

3.1 INSPECTION

A. Before proceeding with any work, the LC shall carefully check and verify all dimensions and quantities, and immediately inform the LA and OAR of any discrepancies between the drawings, specifications, and actual conditions. The LC shall not perform work in any area where there is a significant discrepancy until approval to proceed has been received from the LA.

B. The LC shall verify that rough grading has been completed and there are no errors that will result in poor application or cause latent defects in fine grading and sodding.

C. The LC shall accept job site elevations at plus/minus two/tenths (±0.16) (2") of a foot from finish-grade elevations.

3.2 PREPARATION

A. Preparation for Finish Grading:

1. Weeding: Before and during preliminary and finish grading, the LC shall dig out all weeds and grasses by the roots and dispose of off-site.

Grasses not of the perennial type less than two and one-half inches (2½") high, and not bearing seeds, may be turned under. Perennial weeds and grasses are to be removed. The LC shall also remove other noxious or invasive weeds encountered on the site.

2. Annual beds (if applicable): Removal of existing grass

   a. The LC shall remove existing grass where plant beds are designated for installation on the plans. Layout the planting bed shape and excavate grass only where beds are intended to be installed.

   b. Once planting beds have been installed, the LC shall clean up the edge of any adjacent sod areas and replace and which is damaged in order to give a clean and orderly appearance to the planting beds.

3. The LC shall loosen rough-graded material by roto-tilling to a depth of four inches (4") to six inches (6") and re-grade by hand raking to maintain proper elevations.

4. The LC shall remove all stones over two inches (2") in size, rubbish, and all other extraneous matter from rough grade before beginning finish grading.

5. The grade around building shall be sloped away by the LC at not less than one-fourth inch (¼") per foot, unless otherwise specified.

6. The LC shall slope plant beds for positive drainage: When plants beds are adjacent to buildings, curbs, pavement, or other water-holding obstruction, the LC shall grade the bed(s) before planting to create positive-surface drainage away from plants and buildings.

7. The LC shall grade to facilitate drainage runoff of water as specified on the plans. Low spots shall be filled by the LC.

8. Grubbing, when necessary, shall consist of the removal and disposal of stumps, roots, logs, and other organic, cementitious, or metallic debris not suitable for ease of planting to a depth of not less than eighteen inches (18").

B. Finish Grading:

1. The LC shall grade all lawn and planting areas to a smooth, even, and uniform plane with no abrupt change of surface to establish the correct

finished grades.

2. The LC shall provide positive surface drainage in all areas.

   a. The LC shall not work soil when moisture content is so great that excessive compaction will occur, nor when it is so dry dust will form in the air.

   c. The LC shall apply water, if necessary, to provide ideal moisture for filling and for planting as herein specified.

   d. The LC shall properly grade low spots and pockets to drain to established drainage structures.

3. Elevation of finish grade in all areas adjacent to pavement shall be two inches (2") below grade of pavement when all work including mulching has been completed.

4. The LC shall be provided with a complete copy of the civil construction documents for his use in reviewing existing grading and to use in restoring the areas impacted by their work. The LC shall contact the Owner for the plans.

5. The LC shall re-establish grade levels where settlement, erosion, or other grade changes occur from the point in time when the respective area is turned over to the LC. The LC shall adjust grades, as necessary, to provide positive drainage.

C. Layout and Spacing:

1. The LA shall layout areas for multiple plantings and stake locations for individual encountered during planting, relocate and replant materials at alternate locations as directed by the LA.

2. The LC shall place and plant all plant materials in the location, spacing, and orientation provided in the design specifications. The LC shall make adjustments as directed by the LA, if necessary, to achieve project design objectives.

   a. When plant material is spaced in rows, the LC shall verify all dimensions and space plants equally within the designated areas. The LC shall adjust quantities as required. Rows shall be placed parallel to curbs.

   b. Where plant material is indicated in an informal pattern, the LC

shall space the material as indicated, maintaining consistent spacing with proper consideration for trees, irrigation sprinkler patterns, light standards, and other features.

3. The LC shall space ground cover material triangularly in straight rows at the spacing indicated on the drawings.

4. The LC shall set shrubs that are to be located adjacent to sidewalks or sod edges back from the edge to a distance equivalent to the 'on-center' dimension of that specific shrub.

5. When trees are to be planted prior to construction of finish grades, the LC shall be responsible for locating the position and finish grade relationship to the top of the root ball.

D. Fertilizing:

1. The LC shall remove or redistribute excess soil before application of fertilizer. The LC shall make allowances when establishing finish grades for earth excavated from planting pits and mulch.

2. The LC shall provide fertilizing applications as prescribed by agricultural soils, laboratory tests, and recommendations.

3. For all shrubs and trees, the LC shall place Agriform fertilizer tablets (at specified rates) in the root zones, six inches (6") to eight inches (8") below the finish grade of the soil, no greater than four inches (4") away from the root ball. Verification of tablet placement will be required during final review.

E. Liming:

1. Immediately following, or simultaneously with the incorporation of the fertilizer, the LC shall distribute lime uniformly at a rate determined by tests and incorporate into the soil to a depth of at least one inch (1") by disking, harrowing, or other accepted methods.

2. Do not apply lime under trees.

F. Pre-Emergent Herbicide: When planting beds are cleared of weeds and grass, the LC shall apply an approved pre-emergent herbicide to all shrub and ground cover beds before plant installation.

3.3 PLANTING

A. General:

1. The quantities given in the plant list are approximate only, and the LC shall verify, furnish, and plant all the plants required to complete the work shown on the drawings and in the specifications at no additional cost.

2. All plant material shall be reviewed and receive initial approval from the LA and OAR prior to its delivery to the job site, as deemed necessary by the LA and OAR. Tagging of representative samples of trees and/or shrubs by the LA does not constitute final acceptance of the remaining trees and/or shrubs which the LC is responsible for tagging.

    a. The approval methods will be by nursery site visits or by photographs as set forth under Part 1.05 herein.

    b. Approval of plant materials at this stage will not constitute final acceptance. Approval for all materials will be given only at the time of Final Acceptance by the OAR.

3. The LC shall not perform any planting until all operations involved with the installation of the sprinkler system have been completed, final grades have been established, and the planting areas have been properly graded and approved.

4. The relative position of each tree and plant is subject to approval by the LA and will, if necessary to achieve project design objectives, be relocated as directed.

5. The LC shall remove each plant from its container, scarify the roots on the bottom, and plant in such a manner that when settled it will bear the same relation to the constructed finished grade as it bore to the grade in the container before being transplanted.

    a. Filling will not be permitted around trunks and stems.

    b. Cut and remove all wire and synthetic rope used on root ball.

6. Backfill procedure:

    a. The LC shall tamp firm planting soil into the plant pits.

    b. The LC shall form a shallow basin around plants to hold enough water to saturate the root ball and prepared plant mix.

    c. The LC shall maintain tree saucers until Final Acceptance.

7. The LC shall water plants immediately after planting. The LC shall rake all basins around trees away from root ball before mulching.

8. The LC shall prune at the time of planting with due regard to the natural forms and growth characteristics of each species.

9. Pruning shall be done in a manner complying with standard horticultural practices and shall be limited to the minimum necessary to remove injured twigs and branches and to compensate for the loss of roots during transplanting. Pruning shall not result in the removal of more than one-third (1/3) of the branching structure, nor shall pruning result in alterations to the basic plant structure. Broken or damaged roots shall be cut off smoothly.

10. The LC shall be responsible for supplemental hand watering of trees and shrubs irrigated by rotor irrigation heads and trees irrigated by spray heads on an as-needed basis, but not less than three (3) times weekly, until Final Acceptance. Each time plants are watered, they shall be watered completely saturating the root ball to its full depth.

11. Place mulch between and around specified trees and all shrubs within five (5) days after any planting. For individual trees outside of planting beds, spread mulch to cover the saucer area.

12. Plantings shall be located not less than five feet (5') back from electrical transformers. Maintain a 10' clearance for transformer doors.

13. Disposal of excess soil: Use acceptable excess excavated topsoil to form watering berms around trees and palms. The LC shall dispose of excess soil off-site, or as directed by the OAR. Finish grade shall be maintained to ensure proper surface drainage away from buildings, etc. Excess soil generated by planting pits may not be spread over graded areas, except berms.

B. Planting Container-Grown Trees:

1. The LC shall maintain plants in nursery containers or properly heeled-in until time for transplanting.

2. Can / container cutting: The LC shall open canned/container stock by cutting can vertically on two (2) opposite sides of the can with approved an instrument for the purpose. An ax or spade will not be permitted.

3. The LC shall handle all plants by earth ball or container only. Handling by

the trunk or branches of the plant itself will be cause for rejection. Trees with broken balls will be rejected.

4. The LC shall layout areas and set stakes for trees at locations indicated on the drawings. The LC shall secure approval from the LA before excavating plant pits. The LC shall make necessary adjustments as directed.

5. All proposed trees shall be installed by the LC either entirely in or entirely out of planting beds. Planting bed lines are not to be obstructed. If any tree, shrub, or plant bed settles more than three inches (3") below the established finish grade, it shall be raised to the proper level by the LC and not merely filled with additional planting soil.

6. The LC shall dig each plant pit twice the diameter of the tree root ball. When hardpan or muck is encountered, the LC shall break through to clean sand and backfill with planting soil. The LC shall loosen compacted soil at the sides and bottom of the plant pits by scarifying, or other approved method. The LC shall set each tree to finish grade and fill the plant pit with prepared soil, progressively settling the soil about the root ball by water jetting and flooding to remove voids. In areas where utilities exist, the LC shall be required to hand dig plant pits.

7. The LC shall remove containers from plants and lightly scarify roots before replacement in ground. The LC shall set each tree in the center of the pit in a plumb, vertical position so that crown of ball will be two inches (2") above finish grade. Rotate to obtain best visual appearance and proper relationship to nearby buildings and adjacent plants. The LC shall hold in position until the planting mixture has been flushed into place with a slow, full-hose stream, watered, and settled into place.

8. Fertilizer: The LC shall use twenty-one (21)-gram Agriform tablets with a chemical designation of 16-10-5. The LC will follow manufacturers recommended application rates, but, in no case, will the application be less than the following: one (1) tablet per one-half inch (½") of trunk diameter measured one foot (1') above grade. Planting pit to be backfilled halfway up around the root ball, then equally space the Agriform tablets adjacent to the root ball. The following minor elements will be included:

Zn	Cu
Mg	Fe
Mn	B

9. The LC shall prepare a watering basin the same width as the tree plant ball And water thoroughly immediately following planting. The LC shall

backfill all voids which develop with additional planting soil to bring to finish grade. All basins will remain in place until Final Acceptance and then will be removed by the LC.

10. The LC shall fill all tree pits with water to test proper drainage percolation prior to planting. The LC shall excavate pits that are found to be inadequately draining to a depth sufficient for proper drainage and backfill with course sand. No allowances will be made for plants lost due to improper installation and drainage. If the LC cannot meet proper vertical drainage conditions, contact the LA immediately.

11. Staking, and wrapping: All trees shall be staked as needed unless specifically noted on the plan. Staking of trees will not relieve the LC of the responsibility of resetting plants after they have been blown over, nor will it relieve him of the responsibility for the plant guarantee if the plants die as a result of being blown over. Braces will not be attached to the tree with nails. Any method of bracing other than those set forth in the drawings and specifications must receive prior approval from the LA before installation.

12. The LC shall backfill with planting soil as specified under Section 02910, “Topsoil and Planting Soil Preparation”.

13. The LC shall stake trees as shown on drawings.

14. The LC shall mulch the watering ring of trees with a layer of mulch as specified herein.

C. Planting B&B and WB&B Trees and Large Shrubs:

1. The LA shall install the plant root ball in the pit with the trunk plumb and on undisturbed sub-grade that has been hand-tamped.

2. The LC shall place the ball with burlap intact so location of ground line at top of ball is same as at nursery where grown.

3. The LC shall remove the binding at top l/2 of planting ball and lay the top of burlap back 6 in. For wire balled trees, the LC shall remove the wire from the top ½ of the ball (18" min.) and pull the burlap back after the plant has been stabilized by partially backfilling the planting pit.

4. The LC shall not pull wrapping from under the planting ball.

5. The LC shall not plant if the planting ball is cracked, broken or showing evidence of voids before or during planting process. The LC shall replace

the plant with one of the same species, size, and specification at no cost to Owner.

D. Tree Staking:

1. The LC shall be responsible for staking all trees in accordance with the contract documents.

2. The LC shall be responsible for maintaining staked trees and palms in a plumb condition.

3. The LC shall be responsible for keeping taut all guyed plant material. The method of tightening guy wires shall be approved by the LA. Guying shall be tightened as needed, but within one (1) day of when necessary.

4. Where trees are shown to be installed in pavement area cutout planters, some of which may be fairly small in overall dimension, the LC shall adjust the tree staking detail as necessary. Stakes and guy wires shall be contained within the cut-out planter area and braced against the turned down concrete slab.

E. Bed Preparation for Ground Cover Planting Areas:

1. The LC shall completely remove all existing weeds and grass including the roots, other vegetation (by mechanical methods), construction debris, limerock, etc. and any soil which would be deleterious to plant growth. The LC shall remove unwanted materials from project site and dispose of in an appropriate and legal manner.

2 .For all areas to be planted with Annuals, the LC shall provide a four-inch (4") depth of planting soil over the entire planting bed, till into the bed, and loosen the topsoil in the entire bed by digging and turning over soil. Hand digging may be required in areas where mechanical means would cause damage to underground utilities. Vertical drill, if necessary, through compacted sub-grade to ensure drainage in beds.

F. Preparation of Shrub/Vine Planting Beds:

1. The LC shall remove all existing weeds, grass, and other vegetation including all roots (by mechanical methods) construction debris, limerock, etc. and any soil which would be deleterious to plant growth completely. The LC shall remove all unwanted materials form the project site and dispose of in an appropriate and legal manner.

2. The LA shall chemically treat all areas to be planted with pre-emergent

herbicide ten (10) days before planting is to begin.

3. For all areas to be planted, the LC shall cultivate the soil to a minimum depth of eight inches (8") of prepared planting mix over the entire bed area. Any subsoil debris shall be removed form the site. The LC shall vertically drill areas, if necessary, to promote drainage. The LC shall and dig if utilities are nearby planting site.

G. Planting of Ground Covers:

1. The LC shall space ground cover plants as shown in the plant schedule on drawings.

2. The LC shall moisten ground cover areas prior to planting. Do not set plants in dry soil.

   a. The LC shall not allow rooted plants to dry out before or during planting.

   b. Wilted plants will not be accepted.

3. The LC shall insure adequate vertical drainage in all plant beds and planters. Vertical drilling through any compacted fill to native soil shall be accomplished to insure drainage.

4. The LC shall plant rooted cuttings sufficiently deep to cover all roots.

5. Ground cover plants that have been grown in liners are to remain in liners until time for transplanting.

   a. At the time of transplanting, the soils are to contain sufficient moisture so that it does not fall from the roots when plants are lifted from the liners.

   b. The LC shall plant each plant with its proportionate amount of soil in a manner that will insure a minimum of disturbance to the root system.

6. The LC shall remove containers from ground cover, loosen, and scarify roots before placement in ground.

7. The LC shall excavate round cover pits to eight inches (8") wider and four inches (4") deeper than the plant ball. Pit will be backfilled with planting soil as specified in specification 02910 ‘Topsoil and Planting Soil

Preparation'. Four inches (4") of this mixture will be placed in the pit before placing ground cover. After placing ground cover, the remainder of the pit will be filled to grade with this mixture. The LC shall apply fertilizer at the rate described in this Section. Place fertilizer in mixture while backfilling pit. Leave plant one inch (1") above finished grade.

8. After planting, the LC shall firm-up the earth around each plant sufficiently to force out all air pockets.

9. The LC shall place a twenty-one (21)-gram Agriform tablet with a chemical designation of 20-15-5 per the following application rates:

   a. One (1) gallon container - one (1) tablet.

   b. Three (3)-gallon container - three (3) tablets.

   The LC shall backfill halfway up around the root ball, equally space Agriform tablets adjacent to the root ball. The following minor elements will be included:

Zn	Cu
Mg	Fe
Mn	B

10. The LC shall use alternate procedures in the planting of ground covers only when approved.

11. After all planting and finish grading have been completed, the LC shall top dress all ground cover areas with three inches (3") of mulch as specified under Part 2 - Products. Finish grade including mulch shall be no more than one inch (1") below pavement elevation.

12. The LC shall ensure adequate vertical drainage in all plant beds and planters. Vertical drilling, through any compacted fill to native soil shall be accomplished to ensure drainage.

H. Planting of Shrubs and Vines:

1. The LC shall plant shrubs and vines in pits at least twelve inches (12") greater in diameter than their root ball and at least six inches (6") deeper than the bottom of the ball. The LC shall fill pits with planting soil to be bottom of the ball. When the plant has been properly set, the LC shall fill the pit to the finish grade with and thoroughly settle by tamping and watering.

2. Properly set shall mean that the shrub is at the same soil depth that it was planted at the nursery and the top of the root ball is two inches (2") above the finished grade after being heeled in. Shrubs shall be set plumb and vertical and shall be handled by the root ball only.

3. The LC shall remove all vines from stakes, untie, and securely fasten to the wall, fence, or other surface next to which they are planted in a manner approved by the LA.

4. Shrubs shall be pocket planted in the following manner: The LC shall remove the container from the shrub, loosen, and scarify roots before placement in ground as specified in specification 02910 'Topsoil and Planting Soil Preparation'.

5. The LC shall backfill the pit with a mixture of two (2) parts prepared soil mix to three (3) parts existing soil. Four inches (4") of this mixture shall be placed in the pit before placing shrub. After placing shrub, the remainder of the pit shall be filled to grade with this mixture. Fertilizer shall be applied at the rate described in 3.03 (D) (7). Place fertilizer in mixture while backfilling pit. Leave plant one and one-half inches (1-1/2") above finished grade and final grade to encourage drainage.

6. The LC shall place a twenty-one (21)-gram Agriform tablet with a chemical designation of 20-15-5 per the following application rates:

   a. One (1) gallon container - one (1) tablet.

   b. Three (3)-gallon and five (5)-gallon containers - three (3) tablets.

   c. Seven (7)-gallon containers - four (4) tablets.

   d. Ten (10)-gallon containers - five (5) tablets.

   The LC shall backfill halfway up around the root ball, equally space Agriform tablets adjacent to the root ball. The following minor elements will be included:

Zn	Cu
Mg	Fe
Mn	B

7. After finish grading is completed, the LC shall add a layer of mulch to a height as specified between and around newly planted shrubs as specified under Part 2 - Products. Finish grade including mulch shall be one and one-half inches (1½") to two inches (2") below pavement

elevation.

8. The LC shall insure adequate vertical drainage in all plant beds and planters. Vertical drilling through any compacted fill to native soil shall be accomplished to insure drainage.

3.4 FIELD QUALITY CONTROL

A. The LC shall notify the LA and OAR at least two (2) days in advance so that the following minimum observations can be made as the work progresses:

1. Conditions prior to finish grading and soil preparation.

2. Conditions upon completion of finish grading and soil preparation.

3. Plants, after delivery to site and prior to planting.

4. When shrubs, vines, and trees are spotted or staked for planting prior to excavation of planting holes.

5. Specimen trees at nursery source before delivery to on-site location.

6. Lawn areas prior to sodding.

7. Specimen trees, for condition, upon delivery to job site, and for positioning progressively as work is completed.

8. Review of installation procedures at 25% completion

3.5 MAINTENANCE AND ADJUSTMENT

A. Maintenance:

1. The LA shall begin maintenance immediately after planting: Maintenance shall include, but not be limited to, watering, pruning, repairing washouts, removing debris and dead branches, weeding, maintaining mulch level, mowing, edging, tightening and repairing of guys, replacement of sick, dying, or dead plants, resetting plants to proper grades or upright positions, restoration of the planting saucer or plant bed, and all other care needed for the proper growth of the plant material. The LC shall continuously protect all areas including lawns, plant materials, supports, etc. until Final Acceptance of the work. The Owner reserves the right to back charge for maintenance required that the LC either through omission or neglect does not perform or does not perform in a timely manner. The LC shall report irrigation problems/leaks as soon as possible to the LA.

2. The root system of plants shall be watered by the LC as often as conditions require at such intervals as will keep the surrounding soil in best condition for promotion of root growth and plant life. Supplemental hand watering above the irrigation system watering is the responsibility of the LC until all plant materials are well established. Water when soil moisture is below optimum level for best plant growth. Coordinate and adjust timing of irrigation system with the irrigation contractor plant materials establish. The LC shall note that the irrigation system is not designed to accommodate establishment of trees and palms. It is the LC's responsibility to provide additional water as may be required above what is supplied by the irrigation system until all trees and palms are well established.

3. The LC shall keep planting saucers and beds free of weeds, grass, and other undesirable vegetation growth. All areas shall be 98% weed free upon final acceptance by Owner.

4. The LC shall protect planting areas and plants against trespassing and damage of any kind for the duration of the maintenance period.

5. The LC shall maintain trees, shrubs, ground covers, sod, and other plants until Final Acceptance.

6. During the warranty period, and until its completion date, any plant that is dead of not in satisfactory condition, as determined by the LA, shall be removed and replaced by the LC. Plants replaced shall be inspected and accepted and than guaranteed for an additional six (6) months after the new acceptance date.

7. All plant replacements shall be of the same kind and size as specified in the plant list. They shall be furnished and planted as specified herein. The cost shall be the responsibility of the LC.

8. Spraying and dusting:

    a. During the maintenance period and up to Final Acceptance by the OAR, the LC shall perform all seasonal spraying and dusting of trees and shrubs.

    b. The LC shall use materials and methods in accordance with the highest nursery standards and practices and as directed by the LA or OAR.

B. Adjustment:

1. If planting should occur after sod preparation, the LC shall provide proper protection for sod areas and promptly repair all damage resulting from planting operations.

2. The LC shall provide other adjustments as follows:

a. Re-sod areas, where necessary, for full and even coverage.

b. Re-grade, lightly compact, and replant around sprinkler heads, where necessary, to maintain proper vertical positioning in relation to general grade.

c. Fill all depressions and eroded channels with sufficient soil mix to adjust grade to assure proper drainage. Compact lightly and replant the filled areas in accordance with Contract requirements.

d. Replacement of plants necessary during the maintenance period shall be the responsibility of the LC.

e. In the event that weeds or other undesirable vegetation becomes prevalent, it shall be the LC's responsibility to remove them.

f. Trees or other plants which fall or are blown over during the one (1) year guarantee period will be reset by the LC at no additional expense to the Owner. The only exception being hurricane force winds.

g. Damage resulting from erosion, gullies, washouts, or other causes will be repaired by filling with topsoil, tamping, re-fertilizing, and slope stabilization by the LC.

3.6 CLEAN UP AND PROTECTION

A. Clean Up:

1. During the landscape work, the LC shall store materials and equipment where directed. The LC shall keep pavements clean and work area in an orderly condition.

2. The LC shall keep all planted areas free of debris and insects. The LC shall cultivate, weed, and water until Substantial Completion of the work.

3. Upon completion, the LC shall remove all excess subsoil, cordage,

wrappings, and other extraneous materials from the site. The LC shall remove all tools, equipment, and other materials, except those necessary for maintenance work. The LC shall remove litter or other debris occurring from maintenance operations on a daily basis.

B. Protection:

1. The LC shall provide protection against mechanical damage and protection from vehicles, including posting of signs and barricades, as might be necessary. The LC shall repair, restore, or replace any plants or planting areas which might have become damaged as a result of negligence in complying with these requirements. The LC shall protect all materials and work against injury from any cause and shall provide and maintain all necessary safeguards for protection of the public. The LC shall be held responsible for any damage or injury to person or property which may occur as a result of his/her negligence in the prosecution of the work.

3.7 SUBSTANTIAL COMPLETION AND FINAL ACCEPTANCE PROCEDURES

A. Substantial Completion Procedure:

1. Review of the entire project shall be made upon written request of the LC. The written request for review shall be accompanied by the LC's list of items remaining to be completed or corrected.

2. If all work is satisfactory and complete according to the conditions of the Contract, the LA and OAR shall declare the work substantially complete.

3. If it is determined by the LA and OAR that the LC's work is not substantially complete, the LC shall be responsible to compensate the Owner for the additional time required by the LC to re-inspect the work. Compensation shall be based on the actual time expended by the LA according to his standard hourly rates.

B. Final Completion and Acceptance Procedure:

1. Final completion of work shall mean the full and exact compliance and conformity with the provisions expressed or implied in the drawings and specifications, including the complete removal of trash and debris created by the LC.

2. When all outstanding substantial completion work items are completed, an inspection will be held to determine acceptability. The LC shall notify the OAR and LA in writing at least five (5) business days prior to

anticipated inspection date and make arrangements for the inspection at a time and date convenient to all parties. The LC shall schedule an inspection and notify all concerned parties to be present.

3. Prior to final approval of work, the LC shall perform the following:

   a. Re-sod areas where necessary for full and even coverage.

   b. Remove all debris from landscape areas.

   c. Re-grade, lightly compact, and replant around sprinkler heads, where necessary, to maintain proper vertical positioning in relation to general grade.

   d. Fill all depressions and eroded channels with sufficient soil mix to adjust grade to assure proper drainage, compact lightly, and replant the filled areas in accord with drawing's requirements.

   e. Tighten and adjust all tree guy wires.

   f. Remove watering rings and restore mulch around trees.

   g. Perform any other operations necessary to complete maintenance and ensure that plants are healthy, vigorous, visually pleasing, and undamaged.

4. Upon review of all landscape work, the Owner or his OAR and LA shall approve or disapprove the final acceptance of the Contract in writing. Partial Final Acceptance may be given to the LC, at the Owner's discretion, providing the unacceptable work is corrected immediately thereafter.

5. If the materials are in whole or substantially acceptable at the time of the inspection, a written notice will be given by the OAR stating that the final maintenance period and warranty period begins effective the date of the inspection.

6. After the inspection for Final Acceptance, written acceptance will be given by the Owner for all work of this Section, exclusive of possible replacement of plants subject to warranty.

   a. If any deficiencies of requirements exist, they will be noted in writing.

   b. The LC shall, at the completion of the Final Acceptance, re-grade

all water basins around trees and re-mulch as needed, unless otherwise noted by the OAR.

7. Upon written acceptance being given, the Owner will assume all responsibilities for maintenance of landscape work.

8. At the conclusion of the warranty period, an inspection will be made by the OAR to determine the condition of warranted plant material.

   a. The LC shall remove all plant material noted as not being in a healthy-growing condition.

   b. At no additional cost, the LC shall replace plant material during the following planting season with material of like kind and size, in accordance with specifications for original planting.

   c. The warranty period applies also to replaced material and warranty period will commence upon planting.

END OF SECTION 02930