SECTION 31 11 00 – CLEARING AND GRUBBING

PART 1 -- GENERAL

1.1 THE SUMMARY

The work to be performed consists of the clearing of or the clearing and grubbing of the area along the alignment of construction designated on the Contract Drawings

A. Clearing - Where clearing only is required it shall consist of the cutting and removal of all trees, stumps, shrubs, brush, logs, hedges, and the removal and subsequent replacement of all fences, posts, mail boxes, newspaper boxes, plant life, landscaping, grass and other loose or projecting material from the designated area. Also included is the removal of asphalt and concrete pavement, sidewalks, bicycle paths and other such transportation corridors constructed of stone or other materials.

B. Clearing and Grubbing - Clearing and grubbing shall consist of clearing the surface of the ground of the designated areas to a depth of at least six inches of all trees, stumps, down timber, logs, snags, brush, undergrowth, hedges, grass, weeds, rocks, fences, structures, surface and subsurface debris and rubbish of any nature, natural obstructions or such material which, in the opinion of the ENGINEER, is unsuitable, including grubbing of stumps, roots, matted roots, foundations. All spoil materials resulting from clearing and grubbing shall be disposed of in accordance with all applicable legal and permitting requirements.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Section 02 00 00 – Existing Conditions.

B. Section 31 23 33 – Trenching and Backfilling.

C. FDOT Standard Specifications for Road and Bridge Construction.

1.3 REGULATORY REQUIREMENTS

A. Conform to all federal, state, regional and local codes applicable to the removal, transportation and disposal of debris.

B. Coordinate all clearing work with utility companies having facilities within the immediate area.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. All materials required to be brought to the site for filling of holes caused by grubbing or otherwise shall be consistent with materials of the surrounding area.

PART 3 -- EXECUTION

3.1 SCHEDULE

A. The CONTRACTOR shall schedule clearing and grubbing work a satisfactory distance in advance of the construction operations. All scheduling shall be coordinated with the ENGINEER.

3.2 PREPARATION

A. Existing plant life and features designated to remain are to be tagged or clearly identified in an acceptable manner.

3.3 PROTECTION

A. Protect existing utilities and other improvements to remain in place from damage. Protect survey bench marks and existing structures from damage or displacement.

B. Protect existing trees, shrubs, bushes, brush, hedges, other plant growth and features designated to remain after work in the immediate area is complete. Avoid unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, and smothering by stockpiling construction materials or excavated materials.

C. Restore damaged improvements to their original condition. Provide temporary guards as necessary to protect trees and vegetation to be left standing.

D. Water trees and other vegetation to remain within the limits of the Contract Work as required to maintain their health during the course of construction.

E. Protect roots over 1-1/2" diameter cut during construction. Coat the 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.

3.4 SPOIL MATERIALS

A. All materials to be disposed of by removal from the site shall be disposed of by the CONTRACTOR at the CONTRACTOR's sole expense. The CONTRACTOR shall obtain and file with the ENGINEER, permission obtained in writing from the property OWNER for the use of private property for this purpose. In no case shall any discarded materials be left in windrows or piles adjacent to or within the project limits. The manner and location of disposal of materials shall be subject to review by the ENGINEER and shall not create an unsightly or objectionable view.

3.5 CLEARING

A. Clear the area of all objectionable materials. Trees unavoidably falling outside the area of work must be cut up, removed and disposed of in a satisfactory manner. Trees, stumps and brush shall be cut to a height of not more than twelve inches (12") above the ground. The grubbing of stumps and roots is required.

B. Fences shall be removed and disposed of as directed by the ENGINEER. Fence wire shall be neatly rolled and the wire and posts stored on the project if they are to be used again, or stored at a designated location if the fence is to remain the property of the OWNER.

C. Clear all areas required for access to the site and execution of the Work or where otherwise noted on the Contract Drawings. Remove paving, curbs, sidewalks and paths where required and replace where specified.

3.6 CLEARING AND GRUBBING

A. In areas designated to be cleared and grubbed, all stumps, roots, buried logs, rocks, brush, grass and other unsatisfactory materials shall be removed.

B. All holes remaining after the grubbing operation in embankment areas shall have the sides broken down to flatten out the slopes, and shall be filled with acceptable material, moistened and properly compacted in layers to the density required. The same construction procedure shall be applied to all holes remaining after grubbing in excavation areas where the depth of holes exceeds the depth of the proposed excavation.

C. Carefully and cleanly cut roots and branches of trees indicated to be left standing, only where such roots and branches obstruct the new construction.

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

E. Where trees are indicated to be left standing, stop topsoil stripping a sufficient distance away to prevent damage to the main root system.

F. Fill depressions caused by clearing and grubbing operations with satisfactory soil material. Place fill material in horizontal layers not exceeding 6" loose depth, and thoroughly compact to a density equal to adjacent undisturbed ground.

3.7 REMOVAL

A. Remove debris, rock and extracted plant life from the site and dispose of appropriately.

END OF SECTION

SECTION 31 20 00– EARTH MOVING

PART 1 -- GENERAL

1.1 THE SUMMARY

A. Perform the following earth excavation, backfill, fill and grading as indicated or specified:

1. Make excavations for piping installation and repairs.
2. Provide materials for backfilling excavations as indicated and specified.
3. Grade surfaces to meet finished grades required.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. American Society for Testing and Materials (ASTM) Publications:

1. C33: Specification for Concrete Aggregates.
2. C136: Sieve Analysis of Fine and Coarse Aggregates.
3. D421: Practice for Dry Preparation of Soil Samples for Particle Size Analysis and Determination of Soil Constants.
4. D422: Test Method for Particle-Size Analysis of Soils.
5. DI 140: Test Method for Amount of Material in Soils Finer than the No. 200 (75 Em) Sieve.
6. D1556: Test Method for Density and Unit Weight of Soil In Place by the Sand-Cone Method.
7. D1557: Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft3 (600 kN-m/m3)).
8. D2167: Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
9. D2922: Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods. (Shallow Depth).
10. D3017: Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
11. D4318: Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
12. D4718: Practice for Correction of Unit Weight and Water Content for Soils Containing Oversized Particles.
13. D4944: Test Method for Field Determination of Water (Moisture) Content of Soil by the Calcium Carbide Pressure Tester Method.

14. D4959: Test Method for Field Determination of Water (Moisture) Content of Soil by Direct Heating Method.

15. D5080: Test Method for Rapid Determination of Percent Compaction.

B. Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29: Subpart P - Excavations, Trenching and Shoring.

1.3 DEFINITIONS

A. Percentage of Compaction: Defined as the ratio of the field dry density, as determined by ASTM D1556 to the maximum dry density determined by ASTM D1557 Procedure C, multiplied by 100.

B. Proof Roll: Compaction with a minimum of 4 passes of a vibratory steel drum or rubber tire roller. Vibratory plate compactors shall be used in small areas where vibratory steel drum or rubber tire roller cannot be used.

C. Acceptable Material: Material which does not contain organic silt or organic clay, peat, vegetation, wood or roots, stones or rock fragments over 6-inches in diameter, porous biodegradable matter, loose or soft fill, excavated pavement, construction debris, or refuse. Stones or rock fragments shall not exceed 40 percent by weight of the backfill material.

D. Unacceptable Materials: Material which does not comply with the requirements for the acceptable material or which cannot be compacted to the specified or indicated density.

1.4 CONTRACTOR SUBMITTALS

A. Prior to backfilling and filling, if so directed by the OWNER, facilitate OWNER's acquisition of laboratory testing results of gradation and moisture-density relationship for proposed backfill material, unless reuse of excavated materials is authorized by the OWNER (reference 1.6. E., below).

B. During construction, if so directed by the OWNER, facilitate OWNER's acquisition of confirmation of fill lift thickness, in-place soil, moisture content, and percentage; of compaction (reference 1.6. E., below).

1.5 QUALITY ASSURANCE

A. Excavations shall be performed in the dry, and kept free from water during construction. The CONTRACTOR is responsible for dewatering and groundwater control. Bedding and backfill material shall not be placed in water. Water shall not be allowed to rise upon or flow over the bedding and backfill material.

B. The CONTRACTOR shall be solely responsible for making all excavations in a safe manner. All excavation, trenching, and related sheeting, bracing, etc. shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926 Subpart P) and State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.

C. Formulate excavation, backfilling, and filling schedule arid procedures to eliminate possibility of undermining or disturbing foundations of structures, pipelines and embankments.

D. Backfill and compaction in roadways shall meet FDOT specifications.

E. The CONTRACTOR shall employ an independent testing laboratory to perform particle size and gradation analyses, to determine compactability for all the proposed backfill and fill materials, and to monitor field compaction operations.

F. Testing shall be performed at the OWNER's discretion and paid for by the CONTRACTOR. The OWNER may or may not elect to perform the testing described below.

1. Testing Facilities: Tests shall be performed by an approved commercial testing laboratory. Testing of Backfill Materials: Characteristics of backfill materials shall be determined in accordance with particle size analysis of soils ASTM D 422 and moisture-density relations of soils ASTMD 1557. The OWNER may elect to perform a minimum of one particle size analysis and one moisture-density relation test on each different type of material proposed for bedding and backfill, unless reuse of excavated soil is authorized by the OWNER.

2. Field Density Tests: Field in-place density shall be determined in accordance with ASTM D1556, ASTM D2167, or ASTM D2922. Field in-place moisture content shall be determined in accordance with ASTM D3017, ASTM D4944, or ASTM D4959. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job, on each different type of material encountered, at intervals as directed by the OWNER: The OWNER may elect to perform tests in sufficient numbers to ensure that the specified density is being obtained, with a minimum of one field density test per lift of backfill, and one moisture density relationship for every 1,500 cubic yards used. Trenches improperly compacted shall be reopened to the depth directed, then refilled and compacted to the density specified at no additional cost to the OWNER.

G. Displacement of Sewers: After other tests have been performed and the trench backfill compacted to the finished grade surface, the pipe shall be inspected by the CONTRACTOR using television cameras passed through the pipe to determine whether significant displacement has occurred. If, in the judgment of the OWNER, the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, the defects shall be remedied as directed at no additional cost to the OWNER.

H. Cut pavement with a saw or pneumatic tools to prevent damage to remaining pavement without extra compensation. Where pavement is removed in large pieces, dispose of pieces before proceeding with excavation.

I. Pipes, drains, and other utilities may exist in certain locations not indicated in advance of the work. Completeness or accuracy of information given is not guaranteed. It is the responsibility of the Contractor to obtain utility locations and clearances via Sunshine State One Call.

J. It is the responsibility of the CONTRACTOR to carefully support and protect from damage, existing pipes, poles, wires, fences, curbing, property line markers, and other structures, which the OWNER determines must be preserved in place without being temporarily or permanently relocated. Should such items be damaged, the CONTRACTOR shall restore such items without compensation, to at least as good condition as that in which they were found immediately before the work was begun.

K. In removing existing pipes or other structures, include for payment only those new materials which are necessary to replace those unavoidably damaged as determined by the OWNER.

L. Restore existing property or structures as promptly as practicable.

M. Haul away and properly dispose of surplus excavated materials at no additional cost to the OWNER.

N. During progress of work, conduct earth moving operations and maintain work site so as to minimize the creation and dispersion of dust.

Provide suitable and safe bridges and other crossings where required for accommodation of travel, and to provide access to private property during construction, and remove said structures thereafter.

PART 2 -- PRODUCTS

TRENCH SAFETY SYSTEM

A. The CONTRACTOR shall follow the provisions of the "Florida Trench Safety Act," which incorporates OSHA Standards in 29 CFR 1926.650, Subpart P as the State's trench safety standards. Trench excavation 5 feet or deeper shall have an adequate safety system consisting of sheeting and shoring, suitable trench box, or other suitable system meeting the requirements of the Act.

B. The CONTRACTOR shall be solely responsible for making all excavations in a safe manner. Provide appropriate measures to retain side slopes to ensure that persons working in or near the excavation are protected.

2.2 TRENCH BACKFILL·

A. Granular backfill: Clean granular material well graded from course to fine, free from roots or organic material, maximum size 1.5 inches with maximum of 8% passing the No. 200 sieve.

B. Flowable fill for trench backfill: material conforming to the requirements specified in Division HI of the FDOT Standard Specification for Road and Bridge Construction, latest edition. Flowable fill material shall be proportioned to produce a 28-day compressive strength of approximately 50 to 150 psi.

C. Fine granular backfill: Sand or other granular backfill that is 0.5 inches or less in diameter and free from rocks, sharp objects and debris.

2.3 EQUIPMENT

A. The compaction equipment shall be selected by the CONTRACTOR, and shall be capable of consistently achieving the specified compaction requirements.

PART 3 -- EXECUTION

3.1 EXCAVATION

A. Execution of any earth excavation shall not commence until the related dewatering, excavation support systems, and backfill and fill materials are reviewed by the OWNER and all OWNER's comments satisfactorily addressed.

B. Carry out program of excavation, dewatering, and excavation support systems to eliminate possibility of undermining or disturbing foundations of existing structures or of work previously completed under this contract.

C. Excavate to widths that give suitable room for laying and jointing piping.

D. Establish limits of excavation to allow adequate working space for installing forms and for safety of personnel.

E. Exercise care to preserve material below and beyond the lines of excavations.

F. Place excavated material no closer than 3 feet from edge of excavations to prevent cave-ins.

3.2 SEPARATION OF EXCAVATED MATERIALS FOR REUSE

A. Remove only existing pavement that is necessary for performance of work.

B. Carefully remove acceptable material from excavated areas and store separately for further use as backfill material.

3.3 TRENCH EXCAVATION

A. When pipe is to be laid in gravel bedding or concrete cradle, excavate trench by machinery to, or just below designated subgrade. If material remaining at bottom of trench is disturbed, recompaction shall be required.

B. When pipe is to be laid directly on bottom of trench, do not excavate lower part of trenches by machinery to subgrade. Remove remainder of material to be excavated just before placing of pipe by use of hand tools. Form a flat or shaped bottom, true to grade, so pipe will have a uniform and continuous bearing. Support on firm and undisturbed material between joints, except for limited areas where use of pipe slings have disturbed bottom.

3.4 DEPTH OF TRENCH

A. Excavate trenches to depths so as to permit pipe to be laid at uniform slopes between indicated elevations.

3.5 WIDTH OF TRENCH

A. Make pipe trenches as narrow as practicable and do not widen by scraping or loosening materials from the sides. Make every effort to maintain sides of trenches firm and undisturbed until backfilling has been placed and compacted.

B. Excavate trenches with approximately vertical sides between springline of pipe and elevation 1 ft. above top of pipe.

3.6 EXCAVATION NEAR EXISTING STRUCTURES

A. Discontinue digging by machinery when excavation approaches pipes, conduits, or other underground structures. Continue excavation by use of hand tools.

B. Excavate test pits when determination of exact location of pipe or other underground structure is necessary for doing work properly.

3.7 REUSE AND DISPOSAL OF SURPLUS EXCAVATED MATERIALS

A. Reuse surplus acceptable excavated materials for backfill as approved by the OWNER; deposit neatly and grade so as to make or widen fills, flatten side slopes, or fill depressions; or legally dispose off-site; all as directed or permitted and without additional compensation.

3.8 SUBGRADE PREPARATION AND PROTECTION

A. Utilize excavating equipment equipped with a toothless or smooth edged, excavating bucket to expose the pipe trench foundation subgrade to avoid disturbance of the bearing surface. Tamp the exposed subgrade with the excavating bucket prior to backfilling and filling operation, or placing soil-supported pipeline.

3.9 CARE AND RESTORATION OF PROPERTY

A. Operate machinery with care to prevent injury to trees not to be cut and particularly to overhanging branches and limbs.

B. Cut all branches, limbs, and roots smoothly and neatly without splitting or crushing. Neatly trim, cut the injured portions and cover with an application of grafting wax or tree healing paint as directed.

C. Protect cultivated hedges, shrubs, and plants which might be injured by the CONTRACTOR's operations by suitable means.

D. Do not use or operate tractors, bulldozers, or other power-operated equipment on paved surfaces when their treads or wheels of which are so shaped as to cut or otherwise damage such surfaces.

E. Surfaces and items damaged by the CONTRACTOR's operations, where such damage was not unavoidable as determined by the OWNER, shall be restored by the CONTRACTOR to a condition at least equal to that in which they were found immediately

before work commenced, at the CONTRACTOR's expense. Suitable materials and methods shall be used for such restoration.

3.10 BACKFILLING – GENERAL

A. Do not place, spread, roll or compact fill material during unfavorable weather conditions. If interrupted by heavy rain or other unfavorable conditions, do not resume until ascertaining that the moisture content and density of the previously placed soil are as specified.

B. Do not use puddling, ponding or flooding as a means of compaction.

C. Backfill and compact indicated material under, around, and above pipes to the indicated or specified compaction density requirement. Utilize compaction devices which will not damage the pipe within the trench.

D. Do not drop backfill material into trench from a height of more than 5 ft., or in a manner which will damage the pipe within the trench.

E. Compacting Around Pipes: Compact material around circumference of pipe and the area between the trench wall and the pipe by hand tamping in 6-inch layers.

F. Compacting Above Pipe: Compact material by hand tamping. If trench width is wide enough to accommodate power tools and the compacted material over the pipe will support the load of the power tools without damage to the pipe, use rollers or other powered compaction equipment able to more readily achieve compaction requirements.

3.11 MATERIAL PLACEMENT AND COMPACTION REQUIREMENTS

A. Bedding: Place carefully selected granular backfill or fine granular backfill for pipe bedding to provide uniform longitudinal support under the pipe.

B. Initial backfill (bottom of pipe to 12 inches above top of pipe).

1. Under pipe: Trenches shall be backfilled from the bottom of the trench to the centerline of the pipe with granular or fine granular material free from rocks or stones, placed in 6-inch layers and compacted to 98% of the maximum density, as determined by AASHTO T-180 using the appropriate equipment, under and on each side of the pipe and between the pipe and wall of trench. Where bell and spigot pipe is used, the bell holes shall be deep enough to ensure that the bell does not bear on the bottom of the excavation.

2. Over pipe: From the centerline of the pipe to 12-inches above the top of the pipe, backfill shall be granular or fine granular material free from rocks or stones, placed in 6-inch layers and compacted to 98% of the maximum density, as determined by AASHTO T-180 using the appropriate equipment.

C. Remaining backfill: the remainder of the backfill, to the bottom of road base or existing ground, shall be granular or fine granular material deposited and compacted to achieve 98% of the maximum density, as determined by AASHTO T-180. The backfill shall be deposited and compacted in 9-inch layers when mechanical tampers are used to achieve

compaction. Excavatable flowable fill may be used as an alternative to granular backfill for Remaining Backfill. At the OWNER's direction, the CONTRACTOR shall provide and place flowable fill as backfill without additional expense to the OWNER.

D. Backfilling and filling operation shall be suspended in areas where tests are being made until tests are completed and the testing laboratory has advised the OWNER that adequate densities are obtained.

3.12 COMPACTION CONTROL OF BACKFILL, FILL, AND EMBANKMENT

A. Compact to density specified and indicated for various types of material. Control moisture content of material being placed as specified or if not specified, at a level slightly lower than optimum.

3.13 ALLOWANCE FOR SHRINKAGE

A. Supply specified materials and build up low places as directed, without additional cost if backfilling settles so as to be below the indicated level for proposed finished surface at any time before final acceptance of the work.

END OF SECTION

SECTION 31 22 13– ROUGH GRADING

PART 1 -- GENERAL

1.1 THE SUMMARY

A. Grade and rough contour the site of the work in accordance with the contract plans.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Section 02 00 00 – Existing Conditions

B. Section 31 10 00 – Site Clearing

C. Section 31 20 00 – Earth Moving

D. Section 31 23 00 – Excavation and Fill

E. Section 31 22 19 – Finish Grading

1.3 PROJECT RECORD DOCUMENTS

A. Submit documents which accurately record the locations of utilities remaining, rerouted utilities, and new utilities by horizontal dimensions, elevations, inverts and slope gradients.

1.4 PROTECTION CONTRACTOR SUBMITTALS

A. Protect trees, shrubs, lawns and other features to remain as a portion of the final landscaping as defined on the contract drawings.

B. Protect survey bench marks, existing structures, fences, roads, sidewalks, paving, curbs and other surface and subsurface objects not specifically identified for removal.

C. Protect both above and below ground utilities that are to remain.

D. Repair all damage incurred to existing utilities at no additional expense to the OWNER.

PART 2 -- PRODUCTS

2.1 GENERAL EQUIPMENT REQUIREMENTS

A. Topsoil shall be excavated material, graded free of roots, rocks larger than one inch, debris, large weeds and meeting the requirements of these specifications.

B. Subsoil shall be excavated material, graded free of lumps larger than six inches, rocks larger than three inches and debris.

PART 3 -- EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

A. Identify required lines, levels, contours and reference datum.

B. Identify known below grade utilities. Stake and flag their locations.

C. Identify and flag above grade utilities.

D. Protect existing utilities which pass through the work area.

E. Notify all affected utility companies for locations of existing utilities not less than 48 hours in advance of performing work in the area of such utilities.

F. Expedite the removal or relocation of other utilities far enough in advance so as to not unnecessarily delay the work to be performed under this Contract.

G. Upon discovering unknown utilities or concealed conditions, immediately discontinue the affected work and notify the ENGINEER.

3.2 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, re-landscaped or re-graded and remove excess topsoil not being reused from the site. Do not excavate wet topsoil.

3.3 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be re-landscaped or re-graded and remove excess subsoil not being reused from the site. Do not excavate wet subsoil.

3.4 TOLERANCES

A. Top surface of subgrade, plus or minus one inch.

END OF SECTION

SECTION 31 22 19– FINISH GRADING

PART 1 -- GENERAL

1.1 THE SUMMARY

A. Finish grade subsoil and proof roll. Place, level and compact topsoil.

1.2 PROTECTION

A. Protect landscaping and other features remaining as part of the completed work. Protect existing structures, fences, roads, sidewalks, pavement and curbs.

PART 2 – PRODUCTS

2.1 GENERAL EQUIPMENT REQUIREMENTS

A. Topsoil shall be imported friable loam, free of subsoil, roots, grass, stone and foreign matter, with an acidity range (pH) between 5.6 and 7.5, containing a minimum of 4% and a maximum of 25% organic matter.

PART 3 -- EXECUTION

3.1 SUBSOIL PREPARATION

A. Eliminate uneven areas and low spots. Remove all debris, roots, branches and stones in excess of 1/2 inch in size. Remove subsoil contaminated with petroleum products. Scarify subgrade to a depth of three inches where topsoil is to be placed. Scarify areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.2 PLACEMENT OF TOPSOIL

A. Place topsoil in areas where landscape grading is scheduled. Use topsoil in a dry state and place during dry weather. Fine grade topsoil eliminating rough or low areas. Maintain levels, profiles and contours. Remove stones, roots, grass, weeds, debris and foreign material prior to spreading topsoil.

B. Manually spread topsoil around trees, plants and buildings to prevent damage. Lightly compact placed topsoil. Remove surplus subsoil and topsoil from the site. Leave the stockpile area clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 31 23 00– EXCAVATION AND FILL

PART 1 – GENERAL

1.1 THE SUMMARY

A. The CONTRACTOR shall perform all earthwork indicated and required for construction of the WORK, complete and in place, in accordance with the Contract Documents.

1.2 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall submit samples of all materials proposed to be used in the work in accordance with the requirements in Section 01 33 00 – Submittal Procedures. Sample sizes shall be as determined by the testing laboratory.

PART 2 – PRODUCTS

2.1 SUITABLE FILL AND BACKFILL MATERIAL REQUIREMENTS

A. **General:** Fill, backfill, and embankment materials shall be suitable selected or processed clean, fine earth, rock, or sand, free from grass, roots, brush, or other vegetation.

B. Fill and backfill materials to be placed within 6 inches of any structure or pipe shall be free of rocks or unbroken masses of earth materials having a maximum dimension larger than 3 inches.

C. **Suitable Materials:** Materials not defined as unsuitable below are defined as suitable materials and may be used in fills, backfilling, and embankment construction subject to the indicated limitations. In addition, when acceptable to the ENGINEER, some of the material listed as unsuitable may be used when thoroughly mixed with suitable material to form a stable composite.

D. Suitable materials may be obtained from on-site excavations, may be processed on-site materials, or may be imported. If imported materials are required to meet the quantity requirements of the project, the CONTRACTOR shall provide the imported materials at no additional expense to the OWNER, unless a unit price item is included for imported materials in the bidding schedule.

E. The following types of suitable materials are defined:

1. Type A (three-quarters inch minus granular backfill): Crushed rock or gravel, and sand with the gradation requirements below. The material shall have a minimum sand equivalent value of 28 and a minimum R-value of 78. If the sand equivalent value exceeds 35 the R-value requirement is waived.

Sieve Size	Percentage Passing
3/4-inch	100
No. 4	30 - 50
No. 200	0 – 10

2. Type B (Class I crushed stone): Manufactured angular, crushed stone, crushed rock, or crushed slag with the following gradation requirements. The material shall have a minimum sand equivalent value of 75.

Sieve Size	Percentage Passing
3/4-inch	100
No. 4	30 - 50
No. 200	0 - 5

3. Type C (sand backfill): Sand with 100 percent passing a 3/8-inch sieve, at least 90 percent passing a Number 4 sieve, and a sand equivalent value not less than 30.

4. Type D: Not used.

5. Type E (pea gravel backfill): Crushed rock or gravel with 100 percent passing a 1/2-inch sieve and not more than 10 percent passing a Number 4 sieve.

6. Type F (coarse drainrock): Crushed rock or gravel meeting the following gradation requirements:

Sieve Size	Percentage Passing
2-inch	100
1-1/2-inch	90 - 100
1-inch	20 - 55
3/4-inch	0 - 15
No. 200	0 - 3

7. Type G (aggregate base): Crushed rock aggregate base material of such nature that it can be compacted readily by watering and rolling to form a firm, stable base for pavements. At the option of the CONTRACTOR, the grading for either the 1-1/2-inch maximum size or 3/4-inch maximum size gradation shall be used. The sand equivalent value shall be not less than 22, and the material shall meet the following gradation requirements:

	Percentage Passing	
Sieve Size	1-1/2-inch Max. Gradation	3/4-inch Max. Gradation
2-inch	100	-
1-1/2-inch	90 - 100	-
1-inch	-	100
3/4-inch	50 - 85	90 - 100
No. 4	25 - 45	35 - 55
No. 30	10 - 25	10 - 30
No. 200	2 - 9	2 - 9

8. Type H (graded drainrock): Drainrock shall be crushed rock or gravel, durable and free from slaking or decomposition under the action of alternate wetting or drying. The material shall be uniformly graded and shall meet the following gradation requirements:

Sieve Size	Percentage Passing
1-inch	100
3/4-inch	90 - 100
3/8-inch	40 - 100
No. 4	25 - 40
No. 8	18 - 33
No. 30	5 - 15
No. 50	0 - 7
No. 200	0 - 3

The drainrock shall have a sand equivalent value not less than 75. The finish graded surface of the drainrock immediately beneath hydraulic structures shall be stabilized to provide a firm, smooth surface upon which to construct reinforced concrete floor slabs. The CONTRACTOR shall use, at its option, one of the asphalt types listed below:

	Type 1	Type 2	Type 3
Designation	SC-800	SC-250	RS-1
Spray Temperature (°F)	175-255	165-200	70-120
Coverage (gal/sq yd)	0.50	0.50	0.50

If the surface remains tacky, sufficient sand shall be applied to absorb the excess asphalt.

9. Type I: Any other suitable material as defined herein.

10. Type J (cement-treated backfill): Material which consists of Type H material, or any mixture of Types B, C, G, and H materials which has been cement-treated so that the cement content of the material is not less than 5 percent by weight when tested in accordance with ASTM D 2901 - Test Method for Cement Content of Freshly Mixed Soil Cement. The ultimate compressive strength at 28 days shall be not less than 400 psi when tested in accordance with ASTM D 1633 - Test Method for Compressive Strength of Molded Soil - Cement Cylinders.

11. Type K (topsoil): Stockpiled topsoil material obtained at the site by removing soil to a depth not exceeding 2 feet. Removal of the topsoil shall be done after the area has been stripped of vegetation and debris.

12. Type L (controlled low strength material): Controlled low strength material, if required, shall be in accordance with Section 33 23 23.33 Flowable Fill.

13. Type M (aggregate subbase): Crushed rock aggregate subbase material that can be compacted readily by watering and rolling to form a firm stable base. The sand equivalent value shall be not less than 18 and the material shall meet the following gradation requirements:

Sieve Size	Percentage Passing
3-inch	100
2-1/2 inch	87 - 100
No. 4	35 - 95
No. 200	0 - 29

14. Type N (trench plug): Low permeable fill material, a non-dispersible clay material having a minimum plasticity index of 10.

2.2 UNSUITABLE MATERIAL

A. Unsuitable materials include the materials listed below.

1. Soils which, when classified under ASTM D 2487, fall in the classifications of Pt, OH, CH, MH, or OL.

2. Soils which cannot be compacted sufficiently to achieve the density specified for the intended use.

3. Materials that contain hazardous or designated waste materials including petroleum hydrocarbons, pesticides, heavy metals, and any material which may be classified as hazardous or toxic according to applicable regulations.

4. Soils that contain greater concentrations of chloride or sulfate ions, or have a soil resistivity or pH less than the existing on-site soils.

5. Topsoil, except as allowed below.

2.3 USE OF FILL, BACKFILL, AND EMBANKMENT MATERIAL TYPES

A. The CONTRACTOR shall use the types of materials as designated herein for all required fill, backfill, and embankment construction hereunder.

B. Where these Specifications conflict with the requirements of any local agency having jurisdiction or with the requirements of a pipe material manufacturer, the ENGINEER shall be immediately notified. In case of conflict between types of pipe embedment backfills, the CONTRACTOR shall use the agency specified backfill material if that material provides a greater degree of structural support to the pipe, as determined by the ENGINEER. In case of conflict between types of trench or final backfill types, the CONTRACTOR shall use the agency-specified backfill material if that material provides the greater in-place density after compaction.

C. Fill and backfill types shall be used in accordance with the following provisions:

1. Embankment fills shall be constructed of Type I material, as defined herein, or any mixture of Type I and Type A through Type H materials.

2. Pipe zone backfill, as defined under "Pipe and Utility Trench Backfill" below, shall consist of the following materials for each pipe material listed below.

a. Mortar coated pipe, concrete pipe, and uncoated ductile iron pipe shall be provided Type A or B pipe bedding and embedment backfill material.

b. Coal tar enamel coated pipe, polyethylene encased pipe, tape wrapped pipe, and other non-mortar coated pipe shall be backfilled with Type C bedding and embedment zone backfill material.

c. Plastic pipe and vitrified clay pipe shall be backfilled with Type B bedding and embedment zone backfill material. Vitrified clay pipe shall be backfilled with Type B material to the top of the pipe zone.

d. Where pipelines are installed on grades exceeding 4 percent, and where backfill materials are graded such that there is less than 10 percent passing a Number 4 sieve, trench plugs of Type J, L, or N material shall be provided at maximum intervals of 200 feet unless indicated otherwise

3. Trench zone backfill for pipelines as defined under "Pipe and Utility Trench Backfill" shall be Type I backfill material or any of Types A through H backfill materials or any mixture thereof, except:

   a. Type K material may be used for trench zone backfill in agricultural areas unless otherwise shown or specified.

4. Final backfill material for pipelines under paved areas, as defined under "Pipe and Utility Trench Backfill" shall be Type G backfill material. Final backfill under areas not paved shall be the same material as that used for trench backfill, except that Type K material shall be used for final backfill in agricultural areas unless otherwise indicated.

5. Trench backfill and final backfill for pipelines under structures shall be the same material as used in the pipe zone, except where concrete encasement is required by the Contract Documents.

6. Aggregate base materials under pavements shall be Type G material constructed to the thicknesses indicated. Aggregate subbase shall be Type M material.

7. Backfill around structures shall be Type I material, or Types A through Type H materials, or any mixture thereof, except as shown.

8. Backfill used to replace pipeline trench over-excavation shall be a layer of Type F material with a 6-inch top filter layer of Type E material or filter fabric to prevent migration of fines for wet trench conditions or the same material as used for the pipe zone backfill if the trench conditions are not wet.

9. The top 6 inches of fill on reservoir roofs, embankment fills around hydraulic structures, and all other embankment fills shall consist of Type K material, topsoil.

10. Filter fabric shall be **Mirafi 140 N, Mirafi 700X,** or approved equal.

2.4 MATERIALS TESTING

A. All soils testing of samples submitted by the CONTRACTOR will be done by a testing laboratory of the CONTRACTOR'S choice approved by the OWNER at the CONTRACTOR'S expense. At its discretion, the ENGINEER may request that the CONTRACTOR supply samples for testing of any material used in the work.

B. Particle size analysis of soils and aggregates will be performed using ASTM D 422 - Method for Particle-Size Analysis of Soils.

C. Determination of sand equivalent value will be performed using ASTM D 2419 - Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

D. **Unified Soil Classification System:** References in this Section to soil classification types and standards shall have the meanings and definitions indicated in ASTM D 2487 - Classification of Soils for Engineering Purposes. The CONTRACTOR shall be bound by all applicable provisions of said ASTM D 2487 in the interpretation of soil classifications.

E. The testing for chloride, sulfate, resistivity, and pH will be done in accordance with accepted State laboratory standards and procedures.

PART 3 -- EXECUTION

3.1 EXCAVATION - GENERAL

A. **General:** Except when specifically provided to the contrary, excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the WORK. The removal of said materials shall conform to the lines and grades indicated or ordered. Unless otherwise indicated, the entire construction site shall be stripped of all vegetation and debris, and such material shall be removed from the site prior to performing any excavation or placing any fill. The CONTRACTOR shall furnish, place, and maintain all supports and shoring that may be required for the sides of the excavations. Excavations shall be sloped or otherwise supported in a safe manner in accordance with applicable State safety requirements and the requirements of OSHA Safety and Health Standards for Construction (29CFR1926).

3.2 REMOVAL AND EXCLUSION OF WATER

A. The CONTRACTOR shall remove and exclude water, including stormwater, groundwater, irrigation water, and wastewater, from all excavations. Dewatering wells, wellpoints, sump pumps, or other means shall be used to remove water and continuously maintain groundwater at a level at least two feet below the bottom of excavations before the excavation work begins at each location. Water shall be removed and excluded until backfilling is complete and all field soils testing has been completed.

B. The CONTRACTOR shall dispose of water from the WORK in a suitable manner without damage to adjacent property. CONTRACTOR shall be responsible for obtaining any permits that may be necessary to dispose of water. No water shall be drained into work built or under construction without prior consent of the ENGINEER. Water shall be filtered using an approved method to remove sand and fine-sized soil particles before disposal into any drainage system.

3.3 STRUCTURE, ROADWAY, AND EMBANKMENT EXCAVATION

A. **Excavation Beneath Structures and Embankments:** Except where otherwise indicated for a particular structure or ordered by the ENGINEER, excavation shall be carried to the grade of the bottom of the footing or slab. Where indicated or ordered, areas beneath structures or fills shall be over-excavated. The subgrade areas beneath embankments shall be excavated to remove not less than the top 6 inches of native material and where such subgrade is sloped, the native material shall be benched. When such over-excavation is indicated, both

over-excavation and subsequent backfill to the required grade shall be performed by the CONTRACTOR. When such over-excavation is not indicated but is ordered by the ENGINEER, such over-excavation and any resulting backfill will be paid for under a separate unit price bid item if such bid item has been established; otherwise payment will be made in accordance with a negotiated price. After the required excavation or over-excavation has been completed, the exposed surface shall be scarified to a depth of six inches, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain 95 percent of maximum density.

B. **Excavation Beneath Paved Areas:** Excavation under areas to be paved shall extend to the bottom of the aggregate base or sub-base, if such base is called for; otherwise it shall extend to the paving thickness. After the required excavation has been completed, the top twelve inches of exposed surface shall be scarified, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain 95 percent of maximum density. The finished subgrade shall be even, self-draining, and in conformance with the slope of the finished pavement. Areas that could accumulate standing water shall be re-graded to provide a self-draining subgrade.

C. **Notification of ENGINEER:** The CONTRACTOR shall notify the ENGINEER at least 3 days in advance of completion of any structure excavation and shall allow the ENGINEER a review period of at least one day before the exposed foundation is scarified and compacted or is covered with backfill or with any construction materials.

3.4 PIPELINE AND UTILITY TRENCH EXCAVATION

A. **General:** Unless otherwise indicated or ordered, excavation for pipelines and utilities shall be open-cut trenches with widths as indicated.

B. **Trench Bottom:** Except when pipe bedding is required, the bottom of the trench shall be excavated uniformly to the grade of the bottom of the pipe bedding. Excavations for pipe bells and welding shall be made as required.

C. **Open Trench:** The maximum amount of open trench permitted in any one location shall be 500 feet, or the length necessary to accommodate the amount of pipe installed in a single day, whichever is greater. All trenches shall be fully backfilled at the end of each day or, in lieu thereof, shall be covered by heavy steel plates adequately braced and capable of supporting vehicular traffic in those locations where it is impractical to backfill at the end of each day. The above requirements for backfilling or use of steel plate will be waived in cases where the trench is located further than 100 feet from any travelled roadway or occupied structure. In such cases, however, barricades and warning lights meeting safety requirements shall be provided and maintained.

D. **Trench Over-Excavation:** Where trenches are indicated to be over-excavated, excavation shall be to the depth indicated, and backfill shall be installed to the grade of the bottom of the pipe bedding.

E. **Over-Excavation:** When ordered by the ENGINEER, whether indicated on the Drawings or not, trenches shall be over-excavated beyond the depth and/or width shown. Such over-excavation shall be to the dimensions ordered. The trench shall then be backfilled to the grade of the bottom of the pipe bedding. Over-excavation less than 6 inches below the limits on the Drawings shall be done at no increase in cost to the OWNER. When the over-

excavation ordered by the ENGINEER is 6 inches or greater below the limits shown, or wider, additional payment will be made to the CONTRACTOR. Said additional payment will be made under separate unit price bid items for over-excavation if such bid items have been established; otherwise payment will be made in accordance with a negotiated price.

F. Where pipelines are to be installed in embankments, fills, or structure backfills, the fill shall be constructed to a level at least one foot above the top of the pipe before the trench is excavated.

G. If a moveable trench shield is used during excavation operations, the trench width shall be wider than the shield so that the shield is free to be lifted and then moved horizontally without binding against the trench sidewalls. If the trench walls cave in or slough, the trench shall be excavated as an open excavation with sloped sidewalls or with trench shoring, as indicated and as required by the pipe structural design.

3.5 OVER-EXCAVATION NOT ORDERED OR INDICATED

A. Any over-excavation carried below the grade ordered or indicated, shall be backfilled to the required grade with the indicated material and compaction. Such work shall be performed by the CONTRACTOR at no additional cost to the OWNER.

3.6 EXCAVATION IN LAWN AREAS

A. Where excavation occurs in lawn areas, the sod shall be carefully removed. Excavated material shall be placed in a manner not to damage any additional lawn area as necessary. Immediately after completion of backfilling and testing of the pipeline, new sod shall be placed and lightly rolled in a manner so to restore the lawn as near as possible to its original condition. CONTRACTOR shall provide new sod in kind.

3.7 EXCAVATION IN VICINITY OF TREES

A. Except where trees are indicated to be removed, trees shall be protected from injury during construction operations. No tree roots over 2 inches in diameter shall be cut without express permission of the ENGINEER. Trees shall be supported during excavation by any means previously reviewed by the ENGINEER.

3.8 EXPLOSIVES AND BLASTING

A. Blasting is not permitted.

3.9 DISPOSAL OF EXCESS EXCAVATED MATERIAL

A. The CONTRACTOR shall remove and dispose of all excess excavated material at a site selected by the CONTRACTOR and reviewed by the ENGINEER.

B. The CONTRACTOR shall obtain all required permits, landowner and agency approvals for disposal of excess material, and pay all costs associated with the removal and disposal.

3.10 BACKFILL - GENERAL

A. Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around or upon any structure until the concrete has attained sufficient strength to withstand the loads imposed. Backfill around water retaining structures shall not be placed until the structures have been tested, and the structures shall be full of water while backfill is being placed.

B. Except for drainrock materials being placed in over-excavated areas or trenches, backfill shall be placed after all water is removed from the excavation, and the trench sidewalls and bottom have been dried to a moisture content suitable for compaction.

C. If a moveable trench shield is used during excavation, pipe installation, and backfill operations, the shield shall be moved by lifting the shield free of the trench bottom or backfill and then moving the shield horizontally, The CONTRACTOR shall not drag trench shields along the trench causing damage or displacement to the trench sidewalls, the pipe, or the bedding and backfill.

D. Immediately prior to placement of backfill materials, the bottoms and sidewalls of trenches and structure excavations shall have all loose sloughing, or caving soil and rock materials removed. Trench sidewalls shall consist of excavated surfaces that are in a relatively undisturbed condition before placement of backfill materials.

3.11 PLACING AND SPREADING OF BACKFILL MATERIALS

A. Backfill materials shall be placed and spread evenly in layers not exceeding 18 inches. When compaction is achieved using mechanical equipment, the layers shall be evenly spread so that when compacted each layer shall not exceed 6 inches in thickness.

B. During spreading, each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer. Pipe zone backfill materials shall be manually spread around the pipe so that when compacted the pipe zone backfill will provide uniform bearing and side support.

C. Where the backfill material moisture content is below the optimum moisture content, water shall be added before or during spreading until the proper moisture content is achieved.

D. Where the backfill material moisture content is too high to permit the specified degree of compaction the material shall be dried until the moisture content is satisfactory.

3.12 COMPACTION OF FILL, BACKFILL, AND EMBANKMENT MATERIALS

A. Each layer of Types A, B, C, G, H, I, and K backfill materials as defined herein, where the material is graded such that at least 10 percent passes a No. 4 sieve, shall be mechanically compacted to the indicated percentage of density. Equipment that is consistently capable of achieving the required degree of compaction shall be used and each layer shall be compacted over its entire area while the material is at the required moisture content.

B. Each layer of Type E, F, and J backfill materials shall be compacted by means of at least 2 passes from a flat plate vibratory compactor. When such materials are used for pipe zone

backfill, vibratory compaction shall be used at the top of the pipe zone or at vertical intervals of 24 inches, whichever is the least distance from the subgrade.

C. Flooding, ponding, or jetting shall not be used for fill on roofs, backfill around structures, backfill around reservoir walls, for final backfill materials, or aggregate base materials.

D. Equipment weighing more than 10,000 pounds shall not be used closer to walls than a horizontal distance equal to the depth of the fill at that time. Hand operated power compaction equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations.

E. Backfill around and over pipelines that is mechanically compacted shall be compacted using light, hand operated, vibratory compactors and rollers. After completion of at least two feet of compacted backfill over the top of pipeline, compaction equipment weighing no more than 8,000 pounds may be used to complete the trench backfill.

F. **Compaction Requirements:** The following compaction test requirements shall be in accordance with ASTM D 1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10 lb Rammer and 18-in. Drop for Type A, B, C, G, H, I, K, M, and N materials and in accordance with ASTM D 4253 - Test Methods for Maximum Index Density of Soils Using a Vibratory Table, and D 4254 - Test Methods for Maximum Index Density of Soils and Calculation of Relative Density, for Type B, E, F, and J materials. Where agency or utility company requirements govern, the highest compaction standards shall apply.

Location or Use of Fill	Percentage of Maximum Density	Percentage of Relative Density
Pipe embedment backfill for flexible pipe	95	70
Pipe bedding and over-excavated zones under bedding for flexible pipe, including trench plugs	95	70
Pipe embedment backfill for rigid pipe	90	55
Pipe zone backfill portion above embedment for rigid pipe	95	70
Pipe bedding and over-excavated zones under bedding for rigid pipe	95	70
Final backfill, beneath paved areas or Structures	98	70
Final backfill, not beneath paved areas or structures	90	55
Trench zone backfill, beneath paved areas and structures, including trench plugs	98	70

Trench zone backfill, not beneath paved areas or structures, including trench plugs	95	70
Embankments and fills	90	55
Embankments and fills beneath paved areas or structures	98	70
Topsoil (Type K material)	80	N/A
Aggregate base or subbase (Type G or M material)	95	N/A

3.13 PIPE AND UTILITY TRENCH BACKFILL

A. Pipe Zone Backfill

1. The pipe zone is defined as that portion of the vertical trench cross-section lying between a plane 6 inches below the bottom surface of the pipe and a plane at a point 6 inches above the top surface of the pipe. The bedding is defined as that portion of pipe zone backfill material between the trench subgrade and the bottom of the pipe. The embedment is defined as that portion of the pipe zone backfill material between the bedding and a level line as indicated.

2. After compacting the bedding the CONTRACTOR shall perform a final trim using a stringline for establishing grade, such that each pipe section when first laid will be continually in contact with the bedding along the extreme bottom of the pipe. Excavation for pipe bells and welding shall be made as required.

3. The pipe zone shall be backfilled with the indicated backfill material. The CONTRACTOR shall exercise care to prevent damage to the pipeline coating, cathodic bonds, and the pipe itself during the installation and backfill operations.

4. If a moveable trench shield is used during backfill operations the shield shall be lifted to a location above each layer of backfill material prior to compaction of the layer. The CONTRACTOR shall not displace the pipe or backfill while the shield is being moved.

B. Trench Zone Backfill: After the pipe zone backfills have been placed, backfilling of the trench zone may proceed. The trench zone is defined as that portion of the vertical trench cross-section lying between a plane 6 inches above the top surface of the pipe and a plane at a point 18 inches below the finished surface grade, or if the trench is under pavement, 18 inches below the roadway subgrade.

C. Final Backfill: Final backfill is all backfill in the trench cross-sectional area within 18 inches of finished grade, or if the trench is under pavement, all backfill within 18 inches of the roadway subgrade.

3.14 FILL AND EMBANKMENT CONSTRUCTION

A. The area where a fill or embankment is to be constructed shall be cleared of all vegetation, roots and foreign material. Following this, the surface shall be moistened, scarified to a depth of 6 inches, and rolled or otherwise mechanically compacted. Embankment and fill material shall be placed and spread evenly in approximately horizontal layers. Each layer shall be moistened or aerated, as necessary. Unless otherwise approved by the ENGINEER, each layer shall not exceed 6 inches of compacted thickness. The embankment, fill, and the scarified layer of underlying ground shall be compacted to 95 percent of maximum density.

B. When an embankment or fill is to be made and compacted against hillsides or fill slopes steeper than 4:1, the slopes of hillsides or fills shall be horizontally benched to key the embankment or fill to the underlying ground. A minimum of 12 inches normal to the slope of the hillside or fill shall be removed and re-compacted as the embankment or fill is brought up in layers. Material thus cut shall be re-compacted along with the new material at no additional cost to the OWNER. Hillside or fill slopes 4:1 or flatter shall be prepared in accordance with Paragraph A, above.

C. Where embankment or structure fills are constructed over pipelines, the first 4 feet of fill over the pipe shall be constructed using light placement and compaction equipment that does not damage the pipe. Heavy construction equipment shall maintain a minimum distance from the edge of the trench equal to the depth of the trench until at least 4 feet of fill over the pipe has been completed.

3.15 FIELD TESTING

A. **General:** All field soils testing will be done by a testing laboratory of the CONTRACTOR's choice approved by the OWNER at the CONTRACTOR's expense.

B. Where soil material is required to be compacted to a percentage of maximum density, the maximum density at optimum moisture content will be determined in accordance with Method C of ASTM D 1557. Where cohesionless, free draining soil material is required to be compacted to a percentage of relative density, the calculation of relative density will be determined in accordance with STM D 4253 and D 4254. Field density in-place tests will be performed in accordance with ASTM D 1556 - Test Method for Density of Soil in Place by the Sand-Cone Method, ASTM D 2922 - Test Methods for Density of Soil and Soil-Aggregate in Place By Nuclear Methods (Shallow Depth), or by such other means acceptable to the ENGINEER.

C. In case the test of the fill or backfill show non-compliance with the required density, the CONTRACTOR shall accomplish such remedy as may be required to insure compliance. Subsequent testing to show compliance shall be by a testing laboratory approved by the OWNER and shall be at no additional cost to the OWNER.

END OF SECTION

SECTION 31 23 13 – SUBGRADE PREPARATION

PART 1 -- GENERAL

1.1 THE SUMMARY

A. The work specified in this Section consists of the construction of a stabilized roadway subgrade where required as part of roadway re-construction. Construction shall be to the uniformity, density, and bearing ratio specified herein.

B. Roadways to be re-constructed shall be stabilized to a compacted depth of 12-inches below the base course, and to the original dimensions of the existing roadway. The stabilizing shall be FDOT Type B. The required bearing ratio shall be obtained by constructing the subgrade of select materials salvaged from the existing roadway, or by stabilizing the subgrade material with the addition and mixing in of suitable stabilizing material.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. The type of stabilizing material shall be in accordance with Paragraph 2.1.D herein and shall meet the following requirements:

1. When the utilizing materials from an existing base, this work shall be done prior to the spreading of any additional commercial or local materials. Removal of any section of existing base will not be required until the need for it in maintaining traffic is fulfilled.

2. The use of materials from an existing base may be in combination with the designated type of stabilizing.

B. Commercial Materials:

1. Materials to be used may be either commercial limerock, limerock overburden, or crushed shell.

2. Limerock and Limerock Overburden:

a. The percentage of carbonates of calcium and magnesium shall be at least 10%.

b. The plasticity index shall not exceed 10%.

c. The gradation shall be such that 0.97% of these materials will pass a 1-1/2" sieve.

3. Crushed Shell shall be mollusk shell meeting the following:

a. The use of steamed shell is not permitted.

b. At least 97% by weight of the total material shall pass a 1-inch screen and at least 50% by weight of the total material shall be retained on a No. 4 sieve.

c. Not more than 7.5% by weight of the total material shall pass the No. 200 sieve.

d. If the shell meets the above requirements without crushing, then crushing will not be required.

C. Local Material:

1. Local materials used for stabilizing may be high-bearing-value soils or sand-clay material.

2. The material passing the 40-mesh sieve shall have a liquid limit not greater than 30 and a plasticity index not greater than 10.

3. No blending of materials to meet these requirements will be permitted unless authorized by the ENGINEER.

4. When blending is permitted, the blended material shall be tested and approved before being spread on the roadway.

D. Type B Stabilization:

1. The type of materials, commercial or local, shall be at the CONTRACTOR's option.

2. Bearing value determinations shall be made by the Limerock Bearing Ratio Method.

3. It is the CONTRACTOR's responsibility that the finished roadbed section meets the bearing value requirements, regardless of the quantity of stabilizing materials added.

4. After the roadbed grading operations have been substantially completed, the CONTRACTOR shall make its own determination as to the quantity, if any, of stabilizing materials necessary for compliance with the bearing value requirements.

5. The CONTRACTOR shall notify the ENGINEER of the approximate quantity of stabilizing material to be added. The spreading and mixing in of such materials shall meet the approval of the ENGINEER as to uniformity and effectiveness.

PART 3 -- EXECUTION

3.1 PREPARATION

A. Prior to the beginning of stabilizing operations, the area to be stabilized shall have been constructed to an elevation such that upon completion of stabilizing operations the completed stabilized subgrade will conform to the lines and grades of the existing road subgrade.

B. Prior to the spreading of any additive stabilizing material, the surface of the roadbed shall be brought to a plane approximately parallel to the plane of the proposed finished surface.

C. The subgrade to be stabilized may be processed in one course, unless the equipment and methods being used do not provide the required uniformity, particle size limitation, compaction, and other desired results, in which case, the processing shall be done in more than one course.

3.2 APPLICATION

A. Stabilizing Material:

1. When additive stabilizing materials are required, they shall be spread uniformly over the area to be stabilized.

2. When materials from an existing base are to be utilized, such materials shall be placed and spread prior to the addition of other stabilizing additives.

3. Commercial stabilizing material shall be spread by the use of mechanical spreaders except that where use of such equipment is not practical, other means of spreading may be used, but only upon written approval of the proposed alternate method.

B. Mixing:

1. Mixing shall be done with rotary tillers or other suitable equipment. The area to be stabilized shall be thoroughly mixed throughout the entire depth and width of the stabilizing limits.

2. Mixing will be required regardless of whether the existing soil, or any select soils placed within the limits of the stabilized sections, have the required bearing value without the addition of stabilizing materials.

3. As an exception to the above, where the subgrade is of rock, the Engineer may direct that mixing be waived and no payment made for stabilization of such sections of the roadway.

C. At the completion of mixing, all particles of material within the limits of the area to be stabilized shall pass a 3-1/2-Nc ring. Any particles not meeting this requirement shall be removed from the stabilized area or shall be broken down so as to meet this requirement.

D. After mixing is complete and requirements for bearing value, uniformity, and particle size have been satisfied, the stabilized area shall be compacted in accordance with Paragraph 3.3.B.

E. Materials shall be compacted at a moisture content permitting the specified compaction. If the moisture content of the material is improper for attaining the specified density, either water shall be added or the material shall be permitted to dry until the proper moisture content for the specified compaction is reached.

F. The completed stabilized subgrade shall be shaped to conform with the finished lines, grades, and cross section indicated on the Contract Drawings. The subgrade shall be checked by the use of elevation stakes, or other means approved by the ENGINEER.

G. Requirements For Condition Of Completed Subgrade:

1. After stabilization and compaction, subgrade shall be firm and substantially unyielding to the extent that it will support construction equipment and have the required bearing value.

2. All soft and yielding material, and any other portions of the subgrade that will not compact readily, shall be removed and replaced with suitable material and the whole subgrade brought to line and grade, with proper allowance for subsequent compaction.

H. After completion of the subgrade, the CONTRACTOR shall maintain it free from ruts, depressions, and damage resulting from the hauling or handling of materials, equipment, tools, etc.

I. The CONTRACTOR shall maintain the required density until the base is placed. Such responsibility shall include any repair or replacement of curb and gutter, sidewalk, etc., which may be necessary in order to re-compact the subgrade in the event of underwash or other damage occurring to the previously compacted subgrade.

3.3 FIELD QUALITY CONTROL

A. Bearing Value Requirements:

1. Bearing value samples will be obtained and tested at completion of satisfactory mixing of the stabilized area.

2. For any area where the bearing value is deficient or in excess of the tolerances established herein, additional stabilizing material shall be spread and mixed in accordance with 3.2.B. This shall be done for the full width of the roadway being stabilized and laterally for a distance of 50 feet beyond the limits of the area in which the bearing value is deficient.

3. The following undertolerances from the specified bearing value will be allowed as based on tests performed on samples obtained after mixing operations have been completed:

Specified Bearing Value	Undertolerances
LBR 40	5.0

B. Density Requirements:

1. Within the entire limits of the width and depth of the areas to be stabilized, the minimum density acceptable at any location will be 98% of the maximum density as determined by AASHTO T 180, Test Method D.

END OF SECTION

SECTION 31 23 19 – DEWATERING

PART 1 – GENERAL

1.1 THE SUMMARY

A. The WORK covered by this Section consists of furnishing all permits, labor, equipment, appliances and materials, and performing all operations required for dewatering excavations as required to ensure that all work is performed in the dry. The contract plans may include specific requirements limiting the controlling dewatering near areas of known contamination by VOC's and VOH's.

B. The CONTRACTOR shall not discharge water from dewatering operations in any manner that will:

1. Adversely affect the water quality of adjoining water bodies.
2. Violate Federal, State, or local laws and regulations.
3. Allow discharge to flow onto private property.
4. Hamper the movement of traffic.
5. Damage portions of the WORK previously constructed.

C. Related sections:

1. Section 31 23 33 – Trenching and Backfilling.

1.2 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 – Submittal Procedures.

B. Prior to commencement of excavation, the CONTRACTOR shall submit a detailed plan and operation schedule for dewatering of excavations. The detailed plan shall include mitigation measures to prevent settlement of nearby structures and a contingency plan for restoring nearby structures if settlement is observed as a result of the CONTRACTOR's dewatering operations. The CONTRACTOR may be required to demonstrate the system proposed and to verify that adequate equipment, personnel, and materials are provided to dewater the excavations at all locations and times. The CONTRACTOR's dewatering plan is subject to review by the ENGINEER.

1.3 QUALITY ASSURANCE

A. It shall be the sole responsibility of the CONTRACTOR to control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence.

B. All dewatering operations shall be adequate to assure the integrity of the finished project and shall be the responsibility of the CONTRACTOR.

C. All structures or facilities that are located within the radius of influence of the CONTRACTOR's dewatering operation shall have reference points established and

observed at frequent intervals to detect any settlement which may develop. The responsibility for conducting the dewatering operation in a manner which will protect adjacent structures and facilities rests solely with the CONTRACTOR. The CONTRACTOR shall survey, record and report the reference points on a daily basis, and submit the written log to the ENGINEER at the completion of construction. The ENGINEER shall be immediately notified should any sign of settlement is observed. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the CONTRACTOR.

PART 2 – PRODUCTS

2.1 EQUIPMENT

A. Dewatering, where required, may include the use of well points, sump pumps, temporary pipelines for water disposal, rock or gravel placement, and other means. Standby pumping equipment shall be maintained on the Site.

PART 3 – EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

A. The CONTRACTOR's proposed method for dewatering pipe trenches shall be reviewed by the ENGINEER prior to instituting any such operations. Methods may include wellpoints, sump pumps, bedding rock or other methods approved by the ENGINEER. If a dewater sock method is used, the sock must be grouted in place when work is complete. Wellpoint holes must be grouted or sand wash backfilled.

B. The CONTRACTOR shall provide all labor, materials, tools and equipment necessary to properly control the quality of the discharge from dewatering operations. The CONTRACTOR shall comply with all applicable laws, rules and regulations governing the discharge of water from dewatering operations. The CONTRACTOR shall have on hand, at all times, sufficient pumping equipment and machinery in good working condition and shall have available, at all times, competent workmen for the operation of the pumping equipment. Adequate standby equipment shall be kept available at all times to insure efficient dewatering and maintenance of dewatering operation during power failure.

C. All dewatering shall be accomplished by the use of sanded well points and other techniques deemed necessary by the CONTRACTOR to properly dewater the trench excavations. Well points shall be adequately spaced to provide the necessary dewatering and shall be sandpacked and/or other means used to prevent pumping of fine sands or silts from the subsurface. A continual check by the CONTRACTOR shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.

A. Dewatering for structures and pipelines shall commence when groundwater is first encountered, and shall be continuous until such times as water can be allowed to rise in accordance with the provisions of this Section or other requirements.

B. At all times, site grading shall promote drainage. Surface runoff shall be diverted from excavations. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and be pumped or drained by gravity from the excavation to maintain a bottom free from standing water.

C. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.

D. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with drain rock.

E. The CONTRACTOR shall maintain the water level below the bottom of excavation in all work areas where groundwater occurs during excavation construction, backfilling, and up to acceptance.

F. Flotation shall be prevented by the CONTRACTOR by maintaining a positive and continuous removal of water. The CONTRACTOR shall be fully responsible and liable for all damages which may result from failure to adequately keep excavations dewatered.

G. Upon removal of the wellpoints, the CONTRACTOR must protect the holes and fill with flowable fill within 24 hours. Flowable fill for backfill of wellpoints shall not be measured for payment and shall not be included in the cost of installing the pipe.

H. The CONTRACTOR is responsible for controlling the bacteriological quality of well point discharges into existing bodies of water. The maximum allowable level for fecal coliform in the wellpoint discharge is a mean MPN of 14 per 100 ML with not more than ten percent (10%) of the samples exceeding an MPN of 43 per 100 ML.

I. The CONTRACTOR shall dispose of water from the WORK in a suitable manner without damage to adjacent property. CONTRACTOR shall be responsible for obtaining any permits that may be necessary to dispose of water. No water shall be drained into work built or under construction without prior consent of the ENGINEER. Water shall be filtered using an approved method to remove sand and fine-sized soil particles before disposal into any drainage system.

J. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines, and sewers.

K. Dewatering of trenches and other excavations shall be considered as incidental to the construction of the WORK and all costs thereof shall be included in the various contract prices in the Bid Forms, unless a separate bid item has been established for dewatering.

END OF SECTION

SECTION 31 23 33 – TRENCHING AND BACKFILLING

PART 1 – GENERAL

1.1 THE SUMMARY

A. Furnish labor, materials and equipment to excavate for all underground piping and conduit.

B. Place and compact granular bedding and fill over pipelines and conduits.

C. Dewater excavations as required to maintain dry conditions.

D. In order to avoid existing operational utilities, it may be necessary for pipe to be laid up to twelve inches deeper than the cover specified. At such time the CONTRACTOR is not allowed extra compensation for additional excavation involved, whether the utilities were indicated on the Contract Drawings or not.

E. Density tests for determination of the specified compaction shall be made by a testing laboratory approved by the ENGINEER.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Section 33 05 23.16 – Utility Pipe Jacking

B. Section 31 23 19 – Dewatering

C. Section 31 20 00 – Earth Moving

D. Section 31 23 00 – Excavation and Fill

1.3 QUALITY ASSURANCE

A. Testing of compacted fill materials is required in accordance with these specifications.

B. If results of tests taken during the progress of the work indicate compacted materials do not meet specified requirements, such defective work will be removed, replaced and re-tested as directed by the ENGINEER and at the CONTRACTOR's sole expense.

C. Compacted fill is to be tested before proceeding with the placement of surface materials.

1.4 PROTECTION

A. Protect trees, hedges, shrubs, and lawn areas to receive plantings, rock out-croppings and other features remaining as part of the final landscaping.

B. Protect survey bench marks and existing structures, roads, sidewalks, paving and curbs against damage from vehicular or foot traffic. Install and maintain proper bridging, planking and to provide access to buildings. Maintain access to streets and driveways.

C. Protect excavations by shoring, bracing, sheet piling underpinning, or by other methods, as required to prevent cave-ins or loose soil from falling into excavations.

D. Underpin or otherwise support adjacent structures which may be damaged by excavation work. This includes other utilities.

E. Notify the ENGINEER of any unexpected sub-surface conditions. Discontinue work in the area until the ENGINEER provides notification to resume work.

PART 2 -- PRODUCTS

2.1 BEDDING AND FILL MATERIALS

A. Bedding Materials: Provide granular material, 100% passing a No. 4 sieve, free of organic matter and compacted to 95% density. Use a minimum of six inches of bedding material as measured from the bottom of the pipe bell to natural earth. Bedding material shall support the pipe as shown in the details of the Contract Drawings.

B. Selected Backfill: After pipe joints have been inspected and given preliminary approval by the ENGINEER, and sufficient time has elapsed for setting of joints, if necessary, backfilling shall be performed, together with tamping, until fill is placed to an elevation at least one foot above the top of the pipe bell. During this initial stage of backfilling, approved granular materials or loose free soil from lumps, clods or stones shall be deposited in layers approximately six inches thick and compacted by manually operated machine tampers actuated by compressed air, or by other suitable means. Tampers and machines shall be suitable for the work and subject to approval by the ENGINEER prior to use.

C. Backfill Material: Furnish excavated material, free from roots and rocks larger than 3-1/2 inches in size and building debris.

D. Fill Under Landscaped Areas: Provide material free from alkalis, salts and petroleum products. Use sub-soil excavated from the site only if it conforms to the specified requirements.

PART 3 -- EXECUTION

3.1 PREPARATION AND LAYOUT

A. Establish the limits of excavations by area and elevation. Identify datum elevation.

B. Set lines and levels. Maintain survey benchmarks, monuments and other reference points.

C. Clear the site of all trees, shrubs, paving and objectionable material which interfere with the prosecution of the Work. Vegetation not interfering with the construction shall be protected from damage.

3.2 UTILITIES

A. Before starting excavation operations, establish the location and extent of underground utilities existing in the area of work.

B. Notify the ENGINEER if utility lines which are in the way of the excavation are uncovered.

C. Protect active utility services uncovered by the excavation.

D. Remove abandoned utility lines from areas of excavation. Cap, plug or seal such lines as directed by the ENGINEER and identify at grade.

E. Accurately locate and record the location of abandoned utility lines and active utility lines that are re-routed, re-located or extended on Project Record Documents.

F. Accurately locate and record the location on Project Record Documents of active utility lines whose locations are not accurately reflected on the Contract Drawings.

3.3 TRENCHING

A. Ensure that trenching does not interfere with normal 45 degree bearing splay of any building foundation.

B. Excavate in accordance with lines and grades shown on the Contract Drawings or specified in these Specifications.

C. Cut trenches sufficiently wide to enable safe and proper installation of pipe and to allow for thorough inspection. Trim and shape the trench bottom and leave it free of irregularities, lumps and projections. Excavate whatever substances are encountered to the dimensions and depths specified or shown on the Contract Drawings.

D. Do not disturb soil within the branch spread of existing trees or shrubs that are to remain. If it is necessary to excavate through roots, perform work by hand and cut roots with a sharp axe.

E. When complete, notify the ENGINEER for inspection of excavations. Correct unauthorized excavations as directed, at no cost to the OWNER.

F. Where encountered in the trench bed, rock shall be excavated to a depth of 1/2 of the pipe diameter, but in no case less than 6" below the bottom of the pipe. All undercut trench excavations shall be backfilled and tamped with suitable materials.

G. Unsuitable materials encountered at or below the excavation depth specified or shown on the Contract Drawings shall be removed and replaced to a depth of six inches below the excavation depth and replaced with suitable material.

H. Keep pipe laying operations as close to the excavation operation as possible.

I. All trench excavations shall comply with OSHA Standards.

J. The CONTRACTOR shall provide all trench and structural bracing, sheeting or shoring necessary to construct and protect the excavation, existing utilities, structures and private property as required. Sheeting shall be removed or cut off by the CONTRACTOR during backfilling.

3.4 DEWATERING

A. Keep trenches dry. Provide necessary dewatering equipment including wellpoints, pumps, piping and temporary drains.

B. Do not discharge drainage water into municipal sewers without municipal approval. Ensure water does not contain unacceptable levels of suspended solids.

C. Direct surface drainage away from excavated areas in such a manner as to not create a nuisance to adjacent property or public thoroughfares.

D. Control the grading in and adjacent to excavations to prevent water from running into excavated areas or onto adjacent properties or into public thoroughfares.

E. Direct surface drainage away from excavated areas in such a manner as to not create a nuisance to adjacent property or public thoroughfares.

3.5 BACKFILLING

A. Do not start backfilling until piping has been inspected by the ENGINEER.

B. Maintain trenches free of debris, wood, rocks over 3-1/2 inches in diameter and water.

C. Backfill as early as possible after pipe installation to allow maximum time for natural settlement and compaction. Backfill on both sides of the pipe simultaneously.

D. After backfill has reached a point one foot above the top of the pipe, a variation in the procedure of the placement and amount of compaction of fill may be permitted by the ENGINEER, depending upon the location of the work and the danger from subsequent settlement, as follows:

1. For backfilling in unimproved areas (along utility easements and beyond the edge of driveways and graveled parking areas) from an elevation of one foot above the top of pipe to the surface of the ground, backfill may be deposited by equipment. Depositing in layers or tamping will not be required. Sufficient surplus excavated material shall be neatly rounded over the trench to compensate for settlement. All surplus excavated materials beyond that required above shall be disposed of by the CONTRACTOR.

2. For backfilling beneath driveways and parking areas, alleys and streets where non-rigid type surfacing is to be replaced (including dirt, gravel or cinder driveways and alleys):

   a. Backfill material shall be carefully deposited in uniform layers not to exceed six inches in thickness and each layer shall be compacted to 98% of maximum density in accordance with AASHTO T-180 with manually operated machine tampers.

   b. Excavated material may not be compacted by the water jetting method.

   c. In lieu of the foregoing compaction method, the backfill material and procedure used may be as specified under Method 3, below.

3. For backfilling across and beneath driveways, sidewalks, parking areas or streets where a rigid type paving is to be replaced (i.e., concrete, asphaltic concrete and brick or block surfaces):

a. All backfill material shall be approved granular material of high weight and density. The material shall be carefully deposited in uniform layers not to exceed six inches in thickness (loose measure) and each layer shall be compacted to a density of at least 100% of the maximum density as determined by AASHTO Method T-99, by ramming or tamping with tools approved by the ENGINEER in a manner that does not disturb the pipe. Where necessary, granular base material of the type and thickness specified shall be used for the last layer prior to surfacing.

END OF SECTION

SECTION 31 25 00– EROSION AND SEDIMENTATION CONTROLS

PART 1 -- GENERAL

1.1 THE SUMMARY

A. The CONTRACTOR shall provide erosion protection including fertilizing, seeding, and mulching for all disturbed areas that are not to be paved or otherwise treated in accordance with the Contract Documents.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. **Fertilizer:** Fertilizer shall be a commercial, chemical type, uniform in composition, free flowing, conforming to state and federal laws and suitable for application with equipment designed for that purpose. Fertilizer shall have a guaranteed analysis showing not less than 11 percent nitrogen, 8 percent available phosphoric acid, and 4 percent water-soluble potash.

B. **Seed:** Seed shall be delivered in original unopened packages bearing an analysis of the contents. Seed shall be guaranteed 95 percent pure with a minimum germination rate of 80 percent.

C. **Mulch:** Mulch shall be a fibrous, wood cellulose product produced for this Purpose. It shall be dyed green and shall contain no growth or germination inhibiting substances, and shall be manufactured so that when thoroughly mixed with seed, fertilizer, and water, in the proportions specified it will form homogenous slurry which is capable of being sprayed.

PART 3 -- EXECUTION

3.1 GENERAL

A. **Weather Conditions:** Fertilizing, seeding, or mulching operations will not be permitted when wind velocities exceed 15 miles per hour or when the ground is unduly wet, or otherwise not in a tillable conditions.

B. **Soil Preparation:** The ground to be seeded shall be graded in conformance with the Drawings and shall be loose and reasonable free of large rocks, roots, and other material which will interfere with the work.

C. **Method of Application:** Fertilizer, seed, and mulch may be applied separately (Dry Method), or they may be mixed together with water and the homogeneous slurry applied by spraying (Hydraulic Method), except that all slopes steeper than 3 units horizontal to 1 unit vertical shall be stabilized by the hydraulic method.

3.2 DRY METHOD

A. **Fertilizing:** The fertilizer shall be spread uniformly at the rate of 800 lbs. per acre (approximately 1 lb. per 55 square feet). The fertilizer shall be raked in and thoroughly

mixed with the soil to a depth of approximately two inches prior to the application of seed or mulch.

B. **Seeding:** The seed shall be broadcast uniformly at the rate of 60 lb./acre (approximately 1 lb. Per 730 square feet). After the seed has been distributed it shall be incorporated into the soil by raking or by other approved methods.

C. **Mulch Application:** Mulch shall be applied at the rate of 1,500 lb. (air dried weight) per acre (approximately 1 lb. per 30 square feet).

3.3 HYDRAULIC METHOD

A. The hydraulic method consists of the uniform application by spraying of a homogeneous mixture of water, seed, fertilizer, and mulch. The slurry shall be prepared by mixing the ingredients in the same proportions as specified above. The slurry shall have the proper consistency to adhere to the earth slopes without lumping or running. Mixing time of materials shall not exceed 45 minutes from the time the seeds come into contact with the water in the mixer to the complete discharge of the slurry onto the slopes; otherwise the batch shall be recharged with seed. The mixture shall be applied using equipment containing a tank having a built-in, continuous agitation and recirculation system, and a discharge system which will allow application of the slurry to the slopes at a continuous and uniform rate. The application rates of the ingredients shall be the same as those specified for the Dry Method. The nozzle shall produce a spray that does not concentrate the slurry nor erode the soil.

3.4 WATERING

A. Upon completion of the erosion control seeding, the entire area shall be soaked to saturation by a fine spray. The new planting shall be kept watered by a sprinkling system on the site during dry weather or whenever necessary for proper establishment of the planting until final project acceptance. At no time shall the planting be allowed to dry out. Care shall be taken to avoid excessive washing or puddling on the surface and any such damage caused thereby shall be repaired by the CONTRACTOR at no additional cost to the OWNER.

3.5 MAINTENANCE PRIOR TO FINAL ACCEPTANCE

A. The CONTRACTOR shall maintain the planted areas in a satisfactory condition until final acceptance of the project. Such maintenance shall include the filling, leveling, and repairing of any washed or eroded areas, as may be necessary, and sufficient watering to maintain the plant materials in a healthy condition. The ENGINEER may require replanting of any areas in which the establishment of the vegetative ground cover does not appear to be developing satisfactorily.

END OF SECTION

SECTION 32 01 18– PAVEMENT REPAIR AND RESURFACING

PART 1 - GENERAL

1.1 THE SUMMARY

A. Cutting, removing, protecting and replacing existing pavements encountered including roadways, driveways, sidewalks, curbs and combination curb and gutter.

B. Restoration work shall be kept current with the backfilling operation so as to maintain pedestrian and vehicular traffic.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. AASHTO M-81 - Penetration Graded Asphalt Cement.

B. AASHTO M-140 - Emulsified Asphalt.

C. FDOT Road and Bridge Construction - Section 330 – Hot Mix Asphalt - General Construction Requirements.

D. FDOT Road and Bridge Construction - Section 916 – Bituminous Materials.

E. FDOT Road and Bridge Construction - Section 346 – Portland Cement Concrete.

F. Section 32 16 13 – Curbs and Gutters

G. Section 32 16 23 – Sidewalks

H. Section 32 16 33 – Driveways

1.3 QUALITY ASSURANCE

A. Testing and inspection of asphalt pavement mixes and testing of placed stabilizing base course and asphalt pavement will be performed by an independent testing laboratory appointed and paid for in accordance with these Specifications. Testing and inspection will be performed so as to minimize disruption of the work.

B. Provide the testing laboratory with access to the mixing plant for verification of weights or proportions, character of materials used and determination of temperatures used in the preparation of asphalt concrete mix.

C. When required by the ENGINEER, the testing laboratory will perform laboratory tests on proposed asphalt pavement mixes to determine conformity with the Specifications.

D. The testing laboratory will perform one series of compaction tests for stabilizing base course and for asphalt pavement. The CONTRACTOR shall pay for costs of additional testing as required due to improper performance of the work.

E. When stabilizing base course or a portion thereof that has been placed and compacted in accordance with these specifications, notify the testing laboratory to perform density tests.

Do not place asphalt pavement until the results of tests have been verified and base course installation has been approved by the ENGINEER.

F. If compaction tests indicate that stabilizing base course or asphalt paving do not meet specified requirements, the defective work shall be removed and replaced with acceptable work and the costs thereof, including all additional testing, will be paid by the CONTRACTOR.

PART 2 – PRODUCTS

2.1 GENERAL EQUIPMENT REQUIREMENTS

A. Materials shall be of the same or better grade, type and quality as those removed.

B. Temporary paving shall consist of cold mixed, sand/asphalt pavement. Liquid asphalt shall be grade RC-70 and sand shall conform to the requirements of D.O.T. Specifications for fine aggregates.

C. Tack coat shall be Emulsified Asphalt, Grades RS-2 or CRS-2 conforming to FDOT Standard Specifications. The application rate shall be from 0.02 to 0.08 gallons per square yard.

D. Prime coat, if applied, shall consist of one coat of RC-70 or RC-250 applied at the rate of not less than 0.10 gallons per square yard for limerock bases, and not less than 0.15 gallons per square yard for shell bases.

PART 3 – EXECUTION

3.1 ASPHALTIC CONCRETE

A. Pavements, including all surface courses and base courses, shall be removed to a line back three feet from each edge of the trench, unless otherwise approved by the ENGINEER, cut straight, clean and square with a power saw or other tools and equipment suitable for the work; and in State roads, removal shall comply with the requirements set forth in the FDOT Utility Permit.

B. Street, roadway or alley pavements cut and removed in connection with trench excavations shall be replaced and restored using one of the appropriate methods described as follows:

1. For pavement repair and resurfacing within County road right-of-way, the CONTRACTOR shall excavate the previously placed and compacted backfill and temporary paving to the required depth below the road surface, and replace or restore the cut base course with a limerock base compacted to a minimum thickness of eight inches placed in two layers unless otherwise specified. Alleys shall be restored with a minimum six inch thick base course. During rolling, the base course shall be wetted as necessary to secure the greatest possible compaction. After rolling, the entire surface shall be thoroughly scarified to a depth of not less than three inches and shaped to conform to the required line and grade, then watered and rolled again. Rolling and watering shall continue until the entire depth of the base course is bonded and compacted into an unyielding mass.

a. Asphaltic Concrete repair in County road right-of-way shall comply all applicable requirements of the County.

b. If at any time the subgrade material becomes mixed with the base course materials, the CONTRACTOR shall dig out and remove the mixture, reshape and compact the subgrade and replace the materials removed with clean shell base which shall be watered and rolled until satisfactorily compacted, all at the CONTRACTORs sole expense.

c. After the base course is completed, a surface course of asphaltic concrete shall be placed in the restoration section and the thickness of the new section shall not be less than the existing surface, or one inch, whichever provides for the greatest depth. Existing surfacing of other types shall be replaced with asphaltic concrete, except rigid pavement shall be restored in kind unless otherwise directed by the ENGINEER.

d. The upper surface of the completed base course shall be compacted to an elevation to permit the full depth of the surface course to be constructed without deviation from the grade of the pavement surface. The completed surface shall match the line and grade of the existing surface. When pavement is removed to the edge of the roadway, the replaced base course shall extend at least twelve inches beyond the edge of the surfacing.

e. When the trench parallels an asphalt surfaced arterial roadway, the width of the surface replacement shall extend the full width of a traffic lane. Beyond the normal trench limits, the existing surface course shall be removed to a depth of at least one inch and replaced with the new surface course. The lane edges shall be cut straight and square with a power saw before removal of the existing surface course and the new surfacing material shall be placed to form a straight, smooth and neat joint. If the surface replacement extends into two traffic lanes, then both lanes shall be resurfaced. When surface replacement is required over the full width of a traffic lane or more, the surfacing shall conform to the requirements of Asphaltic Concrete referenced in Section 32 12 16 – Asphalt Paving.

2. For pavement repair and resurfacing within existing F.D.O.T right-of-way, the CONTRACTOR may place a flowable fill base slab in lieu of the limerock base as specified under Paragraph "1." above. The slab shall be at least eight inches thick and not less than two feet wider than the trench or excavation in order to provide a minimum bearing on undisturbed subgrade of one foot on each side of the trench. The slab shall be constructed with F.D.O.T approved flowable fill mix. The finished grade of the slab shall be two inches below the existing pavement surface. The surface course shall then be restored with a Type S-III asphaltic concrete surface course three inches in compacted thickness.

3. Non-surfaced streets, alleys, parking areas and driveways shall be restored with six inches of compacted base material placed in the top of the trench.

4. Pavement restoration in State roads shall conform to all requirements of the State of Florida Department of Transportation as set forth in active Utility Permits.

5. Temporary paving will be required along the entire route of the work where the original paved surface is removed, and the temporary paving shall be placed the same day the trench is backfilled. The trench shall be backfilled up to a level one inch below the existing pavement surface and a temporary cold-mixed sand/asphalt pavement shall be constructed up to the level of the existing pavement surface. The temporary pavement shall be maintained by the CONTRACTOR in a condition satisfactory to the ENGINEER until its removal and replacement, which will be made within 60 days with permanent pavement.

3.2 CONCRETE

A. Concrete sidewalks, curbs, combination curb and gutter, walks, drive ribbons, or driveways shall be removed by initially sawing the structure with a suitable power saw not more than one foot beyond the edge of the trench or excavation. When a formed joint in the concrete exists within three feet of the proposed saw cut and parallels the proposed saw cut, the removal line shall be extended to the formed joint. After sawing, the material shall be removed.

B. Concrete sidewalks, walkways, driveways, and curbs shall be restored using Class I concrete. Expansion joint materials shall conform to the requirements of ASTM-D1751.

C. Replaced portions of these items shall conform to the lines, grades and cross sections of the removed portions. Concrete sidewalks and walkways shall be four inches thick; concrete driveways and driveway ribbons shall be six inches thick. Replaced concrete curb and/or gutter shall joint neatly to the remaining sections. All concrete shall be finished to match adjacent construction and be in conformance with the requirements of the FDOT Concrete Specification

D. Rigid pavement shall be replaced in kind with Class I concrete, using high early-strength cement. The base course for rigid pavement shall be replaced with limerock base material and compacted to a thickness to match the existing base. The CONTRACTOR may place a flowable fill base course in lieu of the limerock base course.

3.3 MISCELLANEOUS ITEMS

A. Pedestrian or School Crossings: Where the pipe route crosses or interferes with school or pedestrian crossings, extreme care shall be taken by the CONTRACTOR to insure the safety of school children and other pedestrians.

B. Pavement Marking: Pavement markings removed or obliterated by the CONTRACTOR's operations shall be replaced at the CONTRACTOR's expense.

3.4 GRASS SHRUBBERY, TREES, ETC.

A. Grass and shrubbery shall be restored to the condition existing prior to making the excavation. All shrubbery, ornamental trees and other plantings shall be fully protected. If it is necessary for the CONTRACTOR to remove grass, shrubbery or plants to accomplish the work, they shall be satisfactorily replaced before the work will be accepted or paid for.

3.5 PROTECTION OF EXISTING IMPROVEMENTS

A. The CONTRACTOR is responsible for the protection of all pavements, sidewalks and other improvements within the work area. All damage done to such improvements as a result of the CONTRACTOR's operations, beyond the limits of the work of pavement replacement as described herein, shall be repaired by the CONTRACTOR at its own expense. The CONTRACTOR, for its own protection should advise the ENGINEER, in writing, of any damaged pavement or other facilities prior to working in an area where such damage exists.

3.6 CLEANUP

A. Cleanup is a part of this Contract. No payment will be made until the cleanup is complete to the satisfaction of the OWNER and the ENGINEER.

END OF SECTION

SECTION 32 10 00– BASES, BALLASTS, AND PAVING

PART 1 – GENERAL

1.1 THE SUMMARY

A. Furnishing all labor, materials, equipment and supplies and performing all operations for the construction of pavement under this Contract.

B. Related sections:

1. Section 31 23 33 – Trenching and Backfilling.
2. Section 32 01 18 – Pavement Repair and Resurfacing.
3. Section 32 16 13 – Curbs and Gutters.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. FDOT Standard Specifications for Road and Bridge Construction, latest edition.

1.3 QUALITY ASSURANCE

A. Quality control is the CONTRACTOR's responsibility. Make every effort to produce the best quality work as specified on the Contract Drawings and in these Specifications.

B. Obtain the services of an independent testing laboratory to perform density tests on the compacted subgrade at locations designated by the ENGINEER.

PART 2 – PRODUCTS

2.1 BASE MATERIAL

A. Limerock meeting the requirements of Section 911 of the FDOT Standard Specifications.

2.2 PRIME AND TACK COATS

A. Supply prime and tack coats conforming to Section 300 of the FDOT Standard Specifications.

2.3 ASPHALTIC CONCRETE

A. Use materials for type S-1, modified asphaltic concrete meeting the requirements of Section 334 of the FDOT Standard Specifications.

B. Restrict oversized aggregate by scalping screens having an opening of 3/4" square. Coarse aggregate: 3/4" passing, 1/2" retained - 0% by weight. Balance the % weight of coarse aggregate by adjusting the remaining size.

2.4 CONCRETE FOR CURBS AND SIDEWALKS

A. Meet the requirements of FDOT Section 346 for Class I concrete.

2.5 EQUIPMENT

A. Use equipment suitable for the operations of pavement replacement and related work.

PART 3 -- EXECUTION

3.1 SUBGRADE STABILIZATION

A. Prepare, grade, stabilize and compact the pavement subgrade to the lines and grades as shown on the Contract Drawings.

B. Compact subgrade to not less than 98% of the maximum density as determined by AASHTO T-99. Subgraded to provide a minimum 75 psi Florida Bearing Value.

3.2 LIMEROCK BASE

A. Prepare, grade and compact all base materials to the required lines and grades in accordance with Section 200 of the FDOT Standard Specifications.

B. Compact base to not less than 98% of the maximum density per AASHTO T-180.

3.3 PRIME AND TACK COATS

A. Apply to the base a prime coat with cover material in accordance with Section 300 of the FDOT Standard Specifications.

B. If required by the ENGINEER, apply a tack coat in accordance with Section 300 of the FDOT Standard Specifications.

3.4 ASPHALTIC CONCRETE SURFACE COURSE (ACSC)

A. Construct asphaltic concrete surface course to the thickness specified.

B. Construct asphaltic concrete surface course in accordance with Sections 320 and 330 of the FDOT Standard Specifications.

3.5 CONCRETE CURBING

A. Form, place and cure concrete curbs in accordance with Section 520 of the FDOT Standard Specifications.

END OF SECTION

SECTION 32 12 16– ASPHALT PAVING

PART 1 – GENERAL

1.1 THE SUMMARY

A. The work to be performed shall include the furnishing of all materials, equipment and labor required to construct an asphalt pavement as herein described and as shown on the Contract Drawings. The asphalt pavement shall be any surface that is composed of a limerock base course and an asphaltic concrete surface course. The CONTRACTOR shall perform all subgrade preparation required for the construction of this asphalt pavement. The work shall be in accordance with these Specifications and shall conform to the dimensions, lines, grades and cross sections shown on the Contract Drawings.

B. Related sections:

1. Section 31 23 00 – Excavation and Fill.
2. Section 31 22 13 – Rough Grading.
3. Section 31 23 33 – Trenching and Backfilling.
4. Section 32 16 33 – Driveways.
5. Section 32 01 18 – Pavement Repair and Resurfacing

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Florida Department of Transportation (F.D.O.T.):

1. F.D.O.T. Standard Specifications for Road and Bridge Construction (latest edition).

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

1. AASHTO T-99 The Moisture-Density Relations of Soils Using a 5.5-lb (2.5 kg) Rammer and a 12-inch (305 mm) Drop.
2. AASHTO T-180 The Moisture-Density Relations of Soils Using a 10-lb (4.54 kg) Rammer and an 18-inch (457 mm) Drop.

C. Palm Beach County Engineering Design Specifications and Drafting Standards.

1.3 TESTING AND INSPECTION

A. Testing and inspection of asphalt pavement mixes and testing of placed stabilized base course and asphalt pavement will be performed by an independent testing laboratory as required in accordance with these specifications. Testing and inspection will be performed so as to minimize disruption of the work.

B. Furnish the testing laboratory with access to the mixing plant for verification of weights or proportions, character of materials used and determination of temperatures used in the preparation of asphalt concrete mix.

C. The testing laboratory will perform laboratory tests on proposed asphalt pavement mixes to determine conformity with these requirements.

D. When stabilized base course or portions thereof have been placed and compacted in accordance with the requirements of these Specifications, notify the testing laboratory to perform density tests. Do not place asphalt until results have been verified and base course installation has been approved by the ENGINEER.

E. If compaction tests indicate that stabilized base course or asphalt pavement do not meet specified requirements, remove the defective work and replace it with acceptable work that has been retested, all at the CONTRACTOR's sole expense.

1.4 QUALITY ASSURANCE

A. Quality control is the CONTRACTOR's responsibility. The CONTRACTOR shall make every effort to produce the best quality of work as specified on the Contract Drawings and in these Specifications.

B. The CONTRACTOR shall retain the services of an independent testing laboratory to perform tests at locations designated by the ENGINEER.

PART 2 – PRODUCTS

2.1 LIMEROCK

A. Limerock shall comply with F.D.O.T. Standard Specifications Section 911 "Base and Stabilized Base Materials". The limerock shall come from a source previously approved by F.D.O.T.

2.2 PRIME COAT

A. Bituminous material used shall be in accordance with F.D.O.T. Section 300-2.1., "Prime Coat" as approved by the ENGINEER or as shown on the Contract Drawings. The temperature of the material shall be between 100 and 150 degrees Fahrenheit, the exact temperature being that which will ensure uniform distribution.

2.3 TACK COAT

A. Tack coat shall conform to F.D.O.T. Section 300-2.3, "Tack Coat".

2.4 ASPHALTIC CONCRETE

A. Asphaltic concrete surface course shall consist of asphaltic concrete Type S-1 or S-III, conforming to Section 334 of the F.D.O.T. "Standard Specifications for Road and Bridge Construction".

B. Restrict oversized aggregate by scalping screens having an opening of 3/4-inch square. Coarse aggregate: 3/4-inch passing, 1/2-inch retained - 0% by weight. Balance the % weight of coarse aggregate by adjusting the remaining size.

2.5 EQUIPMENT

A. Use equipment suitable for the operations of pavement placement and related work.

2.6 QUALITY CONTROL

PART 3 -- EXECUTION

3.1 GENERAL

A. The top of all fills shall be shaped to conform to the grades, lines and cross-sections shown on the plans. The entire area where any layer of limerock base is to be constructed shall be thoroughly compacted by rolling with a power roller weighing not less than 5 tons. If necessary to ensure thorough compaction, water shall be used. The top twelve inches of the subgrade shall be stabilized to an LBR of 40 and compacted to an average density of 100% of the maximum density as determined by AASHTO T-99 (Standard Proctor). The subgrade, prepared as specified, shall be maintained by the CONTRACTOR free from ruts, depressions or other irregularities until the rock base material is spread. A completed subgrade equal to the length of rock base to be constructed on the next day shall be maintained at all times.

3.2 SUBGRADE

A. Prepare, grade, stabilize and compact subgrade to the lines and grades shown on the Contract Drawings.

B. Compact subgrade to not less than 98% of the maximum density as determined by AASHTO T-99. Subgrade shall provide not less than 75 psi Florida Bearing Value.

3.3 LIMEROCK

A. Transporting Limerock: Limerock shall be transported to the point of use, over rock previously placed, if practicable, and dumped on the end of the preceding spread. In no case shall rock be dumped directly on the subgrade.

B. Spreading Limerock: Limerock shall be spread uniformly and graded using equipment suitable for such purpose and subject to approval by the ENGINEER. All segregated areas of fine or coarse rock shall be removed and replaced with well graded rock. The limerock base shall be spread and compacted in three equal layers.

C. Shaping Right-of-Way: The complete right-of-way cross section shown by the Contract Drawings shall be rough graded after the rock has been spread. All work shall be in accordance with Section 200 of F.D.O.T. Standard Specifications.

D. Finishing the Limerock:

1. Equipment: Equipment to be used shall include a self-propelled blade grader weighing not less than 3 tons, with a wheel base not less than fifteen feet and a blade length not less than ten feet; scarifiers shall have teeth space not to exceed 4-1/2 inches apart; at least one three-wheel roller weighing not less than 10 tons; provisions for furnishing water at the site by tank truck or hose at a rate not less than 50 gallons per minute.

2. Compacting Base: After spreading is completed, the entire surface shall be scarified and shaped so as to produce the exact grade and cross section after compaction. The full depth of base shall be compacted to an average density of 98% of maximum density as determined by AAASHO T-180 (Modified Proctor). Where the base is constructed in two courses, the bottom course need only be bladed to secure a uniform thickness.

3. Finishing Base: The finished surface of the rock base shall be true to the required cross section throughout. Any irregularities in the grade greater than 1/4-inch, as determined by placing a ten foot straight edge parallel with the centerline, shall be corrected by scarifying to a depth of three inches, removing or adding rock as may be required and again watering, rolling and compacting the scarified area.

3.4 PRIMING

A. Preparation of Surface: Before any bituminous material is applied, all loose material, dust, dirt and other foreign matter which might prevent proper bonding shall be removed from the base for the full width of application. The surface to be primed shall have the glazed finish removed by "hard-planing" prior to the application.

B. Application: Apply prime coat in accordance with Section 300 of the D.O.T. Standard Specifications. The surface to be primed shall be clean and dry. No bituminous material shall be applied when the ambient temperature of the air is less than 40 degrees Fahrenheit in the shade, or when the weather conditions or the condition of the existing surface is unsuitable. The rate of application shall be not less than 0.1 gallon per square yard, and shall be sufficient to coat the surface thoroughly and uniformly without having any excess to puddle on or flow off the base. Application shall be by self-propelled pressure distributor, operating under a pressure not less than 20 pounds per square inch.

C. Sanding: A uniform application of clean sand shall be applied prior to opening the prime base to traffic, in which case the sand shall be rolled with a traffic roller in conjunction with traffic to cure the prime coat. The sand to be used shall be free of silt, rock particles, sticks, trash, vegetation or other deleterious materials.

3.5 TACK COAT

A. Tack coat shall be applied if a primed surface is determined to be unsuitable to receive the surface course without tacking. Apply the tack coat in accordance with Section 300 of the F.D.O.T. Standard Specifications. Existing asphalt pavement that is to be resurfaced shall also receive a tack coat. A tack coat shall be applied in between the one inch course of a two inch asphaltic concrete course as shown on the Contract Drawings.

3.6 ASPHALTIC CONCRETE

A. Transporting Asphaltic Concrete: Asphaltic concrete mixture shall be transported in tight vehicles previously cleaned of all foreign material and each load shall be covered with a waterproof canvas cover of sufficient size to protect it from weather conditions. The inside surface of the truck body may be thinly coated with soapy water, or a mixture of water with not more than 10% of lubricating oil. After coating the bodies, they shall be raised so that all excess water will drain out before placing any mixture therein. Kerosene, gasoline or similar products shall not be used.

B. Placing Asphaltic Concrete:

1. Machine Spreading: Upon arrival, the mixture shall be dumped into an approved mechanical spreader and immediately spread and struck off to the full width required and to such appropriate loose depth that when work is completed, the specified thickness will be secured. An excess amount of mixture shall be carried ahead of the screed at all times. Hand raking shall be done behind the machine as required.

2. Hand Spreading: In limited areas where, on account of irregularities or unavoidable obstacles, the use of mechanical spreading and finishing equipment is impracticable, the mixture may be spread by hand.

   a. When hand spreading is authorized, upon arrival the mixture shall be dumped on approved steel dump sheets outside of the area on which it is to be spread and shall then be immediately distributed into place by means of suitable shovels and other tools and spread with rakes in a uniformly loose layer of such depth as shown templet cut to proper crown as will result in a complete course having the thickness required. Any deviation from standard crown or section shall be immediately remedied by placing additional material or removing surplus as directed. The ENGINEER may direct other means of placing the material in addition to the use of rakes, to insure a better control of the depth of material and the surface finish.

   b. During spreading and raking, the workmen shall avoid standing or walking on the mixture to the greatest extent possible, and where this is not possible, the mixture walked upon shall be re-raked and combed to the full depth.

3. General: The mixture shall be laid in accordance with Sections 320 and 330 of the F.D.O.T. Standard Specifications and only when the surface to be covered is dry. No mixture shall be laid when weather conditions are unsuitable or when the ambient air temperature in the shade is below 40 degrees Fahrenheit, except by written permission of the ENGINEER. All defective areas in the foundation shall be replaced as directed at least ten days in advance of laying the mixture.

   a. Any mixture caught in transit by a sudden rain may be laid at the CONTRACTOR's risk, if the surface to be covered is determined by the ENGINEER to be in a suitable condition. In no case shall the mixture be laid while rain is falling or when there is water on the surface to be covered. If, in the opinion of the ENGINEER, the CONTRACTOR made no effort to anticipate the rain and have only a minimum of mixture caught in transit, then no material caught in the rain shall be used.

   b. The temperature of the mixture at the time of spreading shall be within 25 degrees Fahrenheit of the temperature set by the ENGINEER for this stage of the operations, such temperatures to be set between 250 and 340 degrees Fahrenheit.

   c. Before rolling is started, the finished surface shall be checked, any inequalities adjusted, and all drippings, sandy accumulations from the screed, and all fat spots from any source shall be removed and replaced with satisfactory material.

d. Straight edging and back-patching shall be done after initial compaction has been obtained and while the material is still hot.

e. No skin patching shall be done. When a depression is to be corrected while the mixture is hot, the surface shall be well scarified before the addition of fresh mixture. If irregularities occur greater than the limits specified herein, and are not corrected while the mixture is still hot, the irregularities shall be cut out the full depth of the layer and replaced with fresh mixture.

4. Compacting Mixture: After spreading as specified above, the mixture shall be rolled when it has set sufficiently or come to the proper condition to be rolled, and when the rolling does not cause undue displacement or shoving.

a. The motion of the roller shall at all times be slow enough to avoid displacement of the mixture and any displacements shall at once be corrected by the use of rakes and fresh mixture where required. To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened, but an excess of water shall not be used. In all places inaccessible to a roller, the required compaction shall be secured with tamps. Depressions which may develop before the completion of the rolling shall be remedied by loosening the mixture laid and adding new material to bring such depressions to a true surface.

b. Should any depressions remain after final compaction has been obtained, the mixture shall be removed sufficiently and new material added to form a true and even surface. All high spots, high joints, and honeycombs shall be adjusted as directed by the ENGINEER.

c. After compaction, the surface shall not show an excess of asphalt, and any spot showing such excess or other defect, shall be cut out and replaced with fresh mixture and immediately compacted to conform with the surrounding area. Any mixture which becomes loose or broken, mixed or coated with dirt, or in any way defective prior to laying the wearing course shall be removed and replaced with fresh mixture which shall be immediately compacted to conform with the surrounding area. The density of the compacted surface course shall not be less than 95% of the laboratory-compacted density of the surface course mixture.

d. Gasoline or oil from rollers shall not be allowed to deposit on the pavement and all places damaged by such deposits shall be removed and replaced as directed by the ENGINEER.

e. Any mixture remaining un-bonded after rolling shall be removed and replaced.

3.7 FIELD QUALITY CONTROL

A. A. Surface Requirements: The finished surface shall be uniform and conform to the lines and grades as shown on the Contract Drawings. Depressions greater than 1/4-inch under a 16 foot straightedge which develop after the initial rolling shall be remedied by loosening or removing the mixture laid and adding new material to bring the depression to a true surface.

B. Protection of Pavement: After the completion of the pavement, no vehicular traffic shall be permitted on the pavement until it has set sufficiently to prevent detriment therefrom

END OF SECTION

SECTION 32 16 13– CURBS AND GUTTERS

PART 1 -- GENERAL

1.1 THE SUMMARY

A. The work to be performed includes the installation of all concrete curb and/or valley gutter removed and/or damaged during the course of construction of the work.

B. The CONTRACTOR shall exercise reasonable care in removing curb and gutter and shall dispose of all removed materials appropriately.

C. If any portion of concrete curb and/or gutter is damaged or cut, the entire length of curb and/or gutter must be replaced. No patching of existing curb or gutter will be allowed.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Florida Department of Transportation (F.D.O.T.) Standard Specifications for Road and Bridge Construction, Section 346, "Portland Cement Concrete".

PART 2 -- PRODUCTS

2.1 GENERAL EQUIPMENT REQUIREMENTS

A. The concrete used shall be Class I (3,000 psi in 28 days) in accordance with F.D.O.T. Standard Specification Section 346.

PART 3 -- EXECUTION

3.1 GENERAL

A. The curb face shall be equal to the face of the adjacent undisturbed curb, and the type (i.e., stand up curb or gutter curb) shall be replaced in kind to a condition equal to or better than that which existed previously. Curb that is broken or cracked during construction operations shall be removed and disposed of by the CONTRACTOR at his own expense

END OF SECTION

SECTION 32 16 23 – SIDEWALKS

PART 1 – GENERAL

1.1 THE SUMMARY

A. The work to be performed shall include the installation of concrete sidewalk that has been removed or damaged during the course of construction of the work. The sidewalk shall be replaced to the same width as the original sidewalk that was removed.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Florida Department of Transportation (F.D.O.T.) Standard Specifications for Road and Bridge Construction, Section 346, "Portland Cement Concrete".

B. Palm Beach County Standards for sidewalk construction.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MATERIALS

A. The concrete used shall be Class I (3,000 psi in 28 days) in accordance with F.D.O.T. Standard Specification Section 346.

PART 3 – EXECUTION

3.1 GENERAL

A. The Contractor shall exercise reasonable care in removing sidewalks and shall dispose of removed materials appropriately.

B. All materials, labor, forms, tools and equipment for restoration of the sidewalk shall be supplied by the Contractor. All disturbed sidewalk shall be replaced with four inch (4") thick 3,000 psi concrete (6" thick at driveways and within major road right-of-way) to the widths required.

C. The sidewalk finish shall match as near as possible the original finish.

D. Sidewalk broken or cracked as a result of the construction operations shall be removed and disposed of by the Contractor at his own expense.

END OF SECTION

SECTION 32 16 33– DRIVEWAYS

PART 1 – GENERAL

1.1 THE SUMMARY

A. Driveways Within County Road Right-of-Way:

1. All residential and commercial driveways within County road right-of-way that are paved with concrete or asphalt and cut by the construction shall have a minimum of 8-inches of limerock base.

2. The thickness of the base from the property back and in all easements shall be equal to the thickness of the original base.

3. The base course for asphalt driveways shall be compacted to a minimum of 98% of the maximum density as determined by AASHTO Method T-180.

4. Limerock for pavement base shall conform to the FDOT Standard Specifications.

5. The substitution of shell will not be permitted where the existing base material is limerock.

6. The cost of all asphalt, concrete or other driveway material replacements, and other removals and replacements, shall be included in the cost of the various applicable items of Work, unless a separate bid item is provided.

B. Driveways Within State and Federal Road Right-of-Way:

1. All residential and commercial driveways within State and Federal road right-of-way that are paved with concrete or asphalt and cut by the construction shall have a minimum of 6-inches of flowable fill base.

2. The thickness of the base from the property back and in all easements shall be equal to the thickness of the original base.

3. The flowable fill base course for asphalt driveways shall be permitted to compact and harden to the minimum F.D.O.T. specifications.

4. Flowable fill for pavement base shall conform to the FDOT Standard Specifications and requirements.

5. The cost of all asphalt, concrete or other driveway material replacements, and other removals and replacements, shall be included in the cost of the various applicable items of Work, unless a separate bid item is provided.

PART 2 – PRODUCTS

2.1 ASPHALT DRIVEWAYS

A. The wearing surface for asphalt residential and commercial driveways within County right-of-way shall be 1-3/4 inches of Type II asphalt.

B. The wearing surface for asphalt driveway turnouts within FDOT right-of-way shall be 2-inches of Type S-1 asphalt.

2.2 CONCRETE

A. Concrete for driveways shall be 3,000 psi.

B. The concrete shall be a minimum of 4-inches thick from the property line back and 6-inches thick from the property line to the edge of pavement.

C. The concrete driveway replacement shall be no less than the thickness removed, but not less than that specified above. Concrete shall be cut with a saw.

2.3 OTHER REMOVALS

A. All driveways other than asphalt or concrete within County right-of-way shall be restored with a minimum depth of 8-inches of shell or limerock base.

B. Driveway surface course shall be replaced with like materials.

C. Road shoulders and alleys of shell, limerock, stabilized soil or gravel, where disturbed, shall be restored with like materials as removed. There shall be no mixing of unlike materials. The disturbed area shall be replaced with the appropriate materials to a minimum depth to restore it to a condition equal to or better than conditions existing prior to beginning work.

D. Roadways other than paved streets where disturbed shall be replaced with like materials to a minimum compacted thickness of 8-inches. There shall be no mixing of unlike materials. These roadways shall be compacted to a minimum of 98% of the maximum density as determined by AASHTO Method T-180.

PART 3 – EXECUTION

3.1 STABILIZED SHOULDER RESTORATION

A. Provide a stabilized shoulder to a thickness and width indicated on the Contract Drawings and having a minimum bearing value of 50 psi Florida Bearing Value.

B. Stabilizing shall be Type C Stabilization as defined in the FDOT Standard Specifications.

C. Compaction shall be by rolling with a combination of steel wheel and rubber tire rollers until a minimum density of 98% of the maximum density is reached as tested under AASHTO T-180.

D. Compaction and finishing shall be in accordance with the FDOT Standard Specifications.

3.2 SWALES AND DRAINAGE DITCHES

A. The right-of-way shall be left in as good or better condition than prior to construction.

B. The finished excavated area shall be replaced with the same material as existed when work began.

C. Where swales, shoulders and ditches are disturbed, they shall be stabilized in a manner that will afford protection against erosion.

D. Existing elevations on all drainage ditches and culverts affected by this construction must be measured prior to construction.

E. As-built elevations shall be submitted upon completion of this construction.

END OF SECTION

SECTION 32 17 23– PAVEMENT MARKINGS

PART 1 -- GENERAL

1.1 THE SUMMARY

A. Provide all pavement stripping, traffic signs, and parking stall wheel stops as indicated on the Contract Drawings or specified herein, and as required for a complete installation.

1.2 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall submit shop drawings and other information to the ENGINEER for review in accordance with Section 01 33 00 – Submittal Procedures.

1.3 QUALTIY CONTROL

A. The phrase "DOT Specifications" shall refer to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction. The DOT Specifications, are referred to herein and are hereby made a part of this Contract to the extent of such references, and shall be as binding upon the CONTRACTOR as though reproduced herein in their entirety.

1.4 CERTIFICATIONS

A. The CONTRACTOR shall furnish the manufacturer's certification that all signs furnished conform to these Specifications and shall replace or repair at its expense all signs that fail to meet this requirement.

PART 2 -- PRODUCTS

2.1 PAVEMENT MARKING

A. Paint for pavement strips shall be Sherwin-Williams or Tnemec traffic paint or approved equal.

2.2 PARKING STALL WHEEL STOPS

A. Parking stall wheel stops shall be precast concrete units painted with lettering or numbers as designated by the ENGINEER.

2.3 REFLECTIVE MARKERS

A. Reflective markers shall be installed in the pavement in accordance with OSHA, DOT and County requirements.

2.4 TRAFFIC SIGN

A. General

1. Traffic regulating signs shall conform to the colors, dimensions and requirements of the Manual on Uniform Traffic Control Devices (MUTCD) and displaying the lettering and symbols indicated on the Contract Drawings.

B. Sign Panels and Support members:

1. Sign panels and support members shall conform to Aluminum Association Alloy 6061-T6.

C. Bolts;

1. Bolts shall conform to Aluminum Association Alloy 2024-T4 with an anodic coating 0.0002-inches thick minimum and chromate sealed.

D. Nuts:

1. Nuts shall conform to Aluminum Association Alloy 6269-T9.

E. Reflective Sheeting:

1. Reflective sheeting shall conform to DOT Type "A" requirements.

F. Construction Warning Signs:

1. The CONTRACTOR shall install traffic and warning signs during construction in accordance with OSHA, DOT and County requirements.

PART 3 -- EXECUTION

3.1 FABRICATION

A. Preparation of sign blanks and fabrication of reflectorized faces shall conform to the applicable requirements of DOT Sections 700-4 and 700-5.

3.2 INSTALLATION

A. Signs and supports shall be erected in accordance with the details shown on the Contract Drawings and as specified herein.

END OF SECTION

SECTION 32 31 13– CHAIN LINK FENCES AND GATES

PART 1 -- GENERAL

1.1 THE SUMMARY

A. The CONTRACTOR shall furnish and install vinyl coated chain link fencing and gates as shown and specified including all appurtenant work, complete, all in accordance with the requirements of the Contract Documents.

1.2 CONTRACTOR SUBMITTALS

A. Shop drawings of gates and typical fence and fence corner post construction shall be submitted prior to fabrication according to the provisions of Section 01 33 00 - Submittal Procedures.

PART 2 -- PRODUCTS

2.1 GENERAL EQUIPMENT REQUIREMENTS

A. Fencing shall be six feet high unless otherwise shown. All fencing materials, including gates, shall be hot-dip galvanized and vinyl-coated after fabrication. All materials and components shall be new, first quality items specifically manufactured for the intended application.

2.2 MATERIAL

A. Fence fabric shall be No. 9 gage galvanized steel wire, 2-inch mesh. The fabric shall have a knuckled finish on the top edge and a twisted and barbed finish on the bottom edge. Galvanized wire shall be black vinyl coated unless specified otherwise on the drawings.

B. Fabric ties shall be No. 9 galvanized steel wire, spaced 14 inches apart on posts and 24 inches apart on rails. Aluminum ties will not be permitted. A continuous No. 7 gage galvanized steel wire shall be interlaced with the fabric or attached to the fabric with clips along the extreme bottom of the fence.

C. All posts shall be one-piece without circumferential welds, and shall be as follows:

1. Line posts shall be 2-inch Schedule 40 pipe, 3.65 lb./ft.

2. End and corner posts shall be 2-1/2-inch Schedule 40 pipe, 5.79 lb./ft.

3. Gate posts shall be 3-1/2-inch Schedule 40 pipe, 9.1 lb/ft:

D. Top rail and braces shall be 1-1/4-inch Schedule 40 pipe, 2.27 lb./ft.

E. Stretcher bars shall be 1/4-inch by 3/4-inch steel bars and steel bands for fastening stretcher bars to the posts shall be 1/8-inch by 3/4-inch.

F. Nuts, bolts and screws shall be of steel, hot-dipped galvanized after fabrication, minimum size 3/8-inch diameter.

G. Swing gate frames shall be constructed of pipe at least as heavy as the top rails for the fence and shall be fabricated by welding with all welds ground smooth prior to hot-dip galvanizing and black vinyl coating. Each gate leaf shall be provided with at least one diagonal brace. Frames shall be galvanized after fabrication. Galvanized malleable iron fittings for latching the gate shall be provided. Swing gates shall be hung by at least two steel or malleable iron hinges not less than 3 inches in width. Fabric shall match the fabric used in the fence. Each pair of gates shall be provided with a heavy drop rod latch assembly with a locking device for a padlock.

H. Concrete shall have a minimum compressive strength of 2,000 psi at 28 days.

2.3 VINYL-COATED FENCE

A. Vinyl fabric, posts, and accessories shall meet Federal Specification RR-F-f191/GEN.

B. Vinyl coated posts, rails, and gates shall be Schedule 40 or SS40 construction.

C. Fence fabric, posts, and accessories shall be polyvinylchloride (PVC) coated over 2.9 zinc coated steel or polyvinylchloride (PVC) coated over aluminum high tensile steel wire.

D. Fabric: Mesh shall be 2-inch gauge specified.

E. PVC coated wire shall be uniform color and capable of being woven into fabric without the PVC coating cracking, crazing or peeling.

F. PVC coating shall not shrink more than 1/16-inch per foot of length, demonstrate a significant visual change in color or gloss, or exhibit breaks, cracks, crazing, crumbling, or other visual forms of failure.

2.4 VINYL FENCE FABRIC

A. All vinyl fence fabric shall be applied in a manner that results in a fused and bonded adherence.

B. Fabric, posts, rails, and accessories shall be black in color.

C. Vinyl fence fabric shall meet the following specifications:

	Core Inches 0.005	Finish Wire Gauge	Minimum PVC Thickness (in.)	Minimum Breaking Strength
Zinc Coated Steel	0.148	9	0.006	1,290
Aluminum Coated Steel	0.130	9	0.006	1,290

D. Accessories and hardware are to include latches, hinges, stops, and keepers and shall be vinyl coated over zinc-coated steel or aluminum-coated steel in conformance with the materials being used to accomplish the installation.

E. Gates shall include all applicable accessories to provide a fully functional installation.

F. Gate frames shall be constructed from applicable materials Schedule 40 or SS40.

PART 3 – EXECUTION

3.1 INSTALLATION

A. All earth, brush, or other obstructions which interfere with the proper alignment of construction of fences shall be removed and disposed of at the expense of the CONTRACTOR.

B. Line posts shall be spaced at not more than 10-foot intervals, measured from center to center of the posts and generally parallel to the ground slope. Posts shall be set plumb and shall be centered in 12-inch diameter concrete encasement extending 36 inches into the ground.

C. Gate post shall be provided with concrete foundation.

D. Changes in the fence lines, where the horizontal angle is 15 degrees or more, shall be considered as corners and corner posts shall be installed.

1. Bracing shall be provided at all end, gate, and corner posts, the latter in both directions. Horizontal brace rails shall be set midway between top rail and ground running from the corner, end, or gate post to first line post. Diagonal tension members shall connect tautly between posts below horizontal braces.

2. Corner posts shall be installed in lieu of line posts at intervals not exceeding 500 feet and shall be braced horizontally in both directions.

3. The chain-link fabric shall be fastened on the side of the posts as shown or as designated by the ENGINEER. The fabric shall be stretched and securely fastened to the posts, and, between the posts, the top and bottom edges of the fabric shall be fastened to the top rail and tension wire, respectively. The tension wires shall be stretched tight with turnbuckles at the end and corner posts. The bottom tension wire shall be installed on a straight grade between posts.

4. The fabric shall be fastened to the end, corner, and gate posts with stretcher bars and stretcher bar bands spaced at approximately 14 inches on line posts and at approximately 18 inches on tension wires.

5. Encasement concrete for footings shall be placed immediately after mixing in a manner such that there will be no concentration of the large aggregates. The concrete shall be consolidated by tamping or vibrating in an approved manner. Concrete for footings may be placed without forms, providing the ground is firm enough to permit excavation to neat line dimensions. Prior to placing the concrete, the earth around the hole shall be thoroughly moistened. The concrete shall completely fill the hole and top surfaces of the concrete encasement shall be sloped outward to shed water and shall have a neat appearance. Not less than 7 days shall elapse after placing the concrete footings before the fence fabric is fastened to the posts.

6. Any galvanized coating damaged during construction of the fencing shall be repaired by application of molten **Galvo-Weld; Galvinox**; or approved equal.

E. Any black vinyl coating damaged during construction of the fencing shall be repaired to a condition acceptable to the OWNER.

END OF SECTION

SECTION 32 90 00– PLANTING

GENERAL

1.1 THE SUMMARY

A. The CONTRACTOR shall perform all the landscaping and all appurtenant work, complete, in accordance with the requirements of the Contract Documents.

B. Scope of Work: Landscaping as referred to herein shall include, but not be limited to the following WORK: soil preparation, weed control, installation of headers, finish grading, furnishing and installing plant materials, tree staking and tying, cleanup, maintenance, guarantee.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. **Codes:** All codes, as referenced herein, are specified in Section 01 42 19 – Reference Standards.

B. **Federal Specifications:**

1. FS O-F-241D Fertilizer, Mixed, Commercial.
2. FS Q-P-166E Peat, Moss; Peat, Humus; And Peat, Reed Sedge.

C. **Commercial Standards:**

1. ANSI/ASTM D 422 Method for Particle-Size Analysis of Soils.
2. ANSI Z60.1 Nursery Stock.
3. American Association of Nurserymen, Inc.: Rules and Grading Provisions

D. Grades and Standards for Florida Department of Agriculture and Consumer Nursery Plants Services

1.3 PLANT MATERIALS

A. Quality: Trees, palms, shrubs, and other plants shall conform to the standards for Florida Fancy or better as given in the latest edition of Grades and Standards for Nursery Plants, State Plant Board of Florida.

B. Deciduous Trees: Provide trees of height and caliper listed or shown and with branching configuration for Florida Fancy or better as given in the latest edition of Grades and Standards for Nursery Plants for types and species required. Provide single stem trees except where special forms are shown or listed. Call condition variable.

C. Coniferous and Broadleafed Evergreens: Provide evergreens of sizes shown or listed. Dimensions indicate minimum height and spread. Provide specialized quality evergreens with well-balanced form complying with requirements for other size relationships to the primary dimension shown.

D. Existing on-site plant material to be relocated will be tagged by the ENGINEER.

1.4 CONTRACTOR SUBMITTALS

A. **General:** The CONTRACTOR shall furnish a certificate with each delivery or bulk material delivery, stating source, quantity, and type of material. All materials shall conform to specification requirements. All certificates shall be delivered to the ENGINEER at time of each delivery. All bulk delivered materials shall be delivered with level load volume plainly marked on the truck bed.

B. **Topsoil Report:** Topsoil report as well as literature on fertilizers, peat, mulch, Silva-fiber and seed mixes, shall be submitted as specified in Section 01 30 00 – Submittals Procedures.

C. **Certificates of Inspection:** Certificates of inspection of plant material, as may be required by Federal, State, or other authorities having jurisdiction, shall be furnished and accompany the shipment.

D. **Samples:** Typical samples, 3 of each variety and size of plants, shall be submitted for approval at the site. These samples, if approved, shall be planted and maintained as standards for comparison with plants furnished.

E. **Certified Report on Topsoil Analysis:** The CONTRACTOR shall submit for approval by the ENGINEER a certified report by an approved analytical laboratory showing analyses of representative samples of topsoil proposed for use. The topsoil shall not be delivered to the site until approval is received from the ENGINEER. Approval of the laboratory report does not constitute final acceptance. Topsoil shall be subject to rejection by the ENGINEER on or after delivery if it is found not to meet the requirements of the Specifications or does not conform to the laboratory test results.

1.5 QUALITY ASSURANCE

A. General: All plants furnished by the CONTRACTOR shall be true to type or name as shown in the Contract Documents and shall be tagged in accordance with the standard practice recommended by the Agricultural Code of the State of California; however, determination of plant species or variety will be made by the ENGINEER.

B. All plants shall comply with Federal and State laws requiring inspection for plant diseases and infestations. Inspection certificates required by law shall accompany each shipment of plants, and certificates shall be delivered to the ENGINEER.

C. All inspections herein specified will be made by the ENGINEER or its representative. The CONTRACTOR shall request inspection at least 24 hours in advance of the time inspection is required. Inspection will be required on the following stages of the WORK:

1. During preliminary grading, soil preparation, and initial weeding.

2. When trees are spotted for planting, but before planting holes have been excavated.

3. When finish grading has been completed.

4. When all specified work, except the maintenance period has been completed.

5. Final inspection at the completion of the maintenance period.

D. Plants shall be subject to inspection and approval or rejection by the ENGINEER at place of growth and upon delivery to the site at any time before or during progress of the WORK based on.

1. Quantity, quality, size, and variety;

2. Ball and root condition; and

3. Latent defects and injuries resulting from handling, disease, and insects.

E. Plants approved at pre-planting inspection shall still be subject to rejection during planting if found to be below specifications.

F. Rejected plants shall be identified in an obvious manner, removed from the site and replaced with acceptable equals.

G. Plants shall have been grown in nurseries which have been inspected by the governing authorities. Inspection of plant materials required by City, County, State, or Federal authorities shall be the responsibility of the CONTRACTOR, who shall have secured permits or certificates prior to delivery of plants to site.

1.6 CLEANUP

A. Upon completion of all planting operations, the portion of the project site used for a work or storage area by the CONTRACTOR shall be cleaned of all debris, superfluous materials, and equipment. All such materials and equipment shall be entirely removed from the project site as specified in Section 01 77 00 – Closeout Procedures.

B. All walks or pavement shall be swept or washed clean upon completion of the WORK of this section.

C. During the entire contract period, plant containers that have been cut or removed from plant materials shall be removed from the project site daily, in accordance with the provisions for maintenance and guarantee as specified in Section 01 77 00 – Closeout Procedures.

D. **General:** The CONTRACTOR shall be responsible for protecting, watering, and maintaining all planting and irrigation systems until final acceptance of all WORK under the contract.

1. Warrant lawns through specified maintenance period, and until final acceptance. The required period is one full year following installation of lawn areas.

2. Warrant trees for a period of one year after date of substantial completion against defects including death and unsatisfactory growth, except for defects resulting from neglect by OWNER, abuse or damage by others, or unusual phenomena or incidents which are beyond the CONTRACTOR's control.

3. Warrant shrubs for one full year after date of substantial completion.

4. Remove and replace trees, shrubs, or other plants found to be dead or in unhealthy condition during warranty period. Make replacements during growth season following end of warranty period. Replace trees and shrubs which are in doubtful condition at end of warranty period; unless, in opinion of the ENGINEER, it is advisable to extend warranty period for a full growing season.

    a. Another inspection will be conducted at end of extended warranty period, to determine acceptance or rejection. Only one replacement will be required at end of warranty period, except for losses or replacement due to failure to comply with specified requirements.

E. At time of acceptance of the complete project, the lawn shall be totally established with no bare spots, mowed a minimum of 4 times, and the grass shall be at least 1-1/4 to 2 inches in height.

F. **Watering:** Trees and shrubs shall be thoroughly soaked after planting and provided with additional water at intervals as necessary to provide for good health and growth of the planting.

G. Upon completion of lawn seeding, the entire area shall be soaked to saturation by a fine spray. The new planting shall be kept watered by the sprinkling system existing on the site during dry weather or whenever necessary for proper establishment of the lawn. Care shall be taken to avoid excessive washing or puddling on the surface and any such damage caused thereby shall be repaired by the CONTRACTOR at its own expense.

H. **Protection:** The CONTRACTOR shall provide adequate protection to all newly seeded areas including the installation of approved temporary fences to prevent trespassing and damage, as well as erosion control, until the end of the one-year correction period.

I. The CONTRACTOR shall replace any materials or equipment it has damaged or which has been damaged by its employees or subcontractors.

J. Partial utilization of the project shall not relieve the CONTRACTOR of any of the requirements contained in the Contract Documents.

K. **Mowing of Lawn Areas:** First mowing of lawn areas shall begin as soon as the grass has reached a height of 3 inches and subsequent mowing shall be at least once a week, or as often as necessary to maintain all lawn areas at a uniform height of 1-1/2 to 2 inches.

L. For lawns, provide fertilizer with not less than 6 percent phosphoric acid, and 6 percent potassium, and percentage of nitrogen required to provide not less than 1 pound of actual nitrogen per 1,000 square feet of lawn area. Provide nitrogen in a form that will be available to lawn during initial period of growth.

M. Plants shall be maintained in a vigorous, thriving condition by watering, cultivating, weeding, pruning, spraying, and other operations necessary. No trees or shrubs will be accepted unless they are healthy and show satisfactory foliage conditions.

N. All planted areas shall be cultivated at least every 2 weeks and raked smooth, to present a neat appearance, and additional mulch shall be added where necessary.

O. Maintenance shall include, in addition to the foregoing, cleaning, edging, repairs to stakes, wire, and wrappings, the repair of erosion, and all other necessary work of maintenance. Sidewalks and other paved areas shall be kept clean while planting and maintenance are in progress.

P. Any and all sprinkler lines broken or disrupted during this construction shall be replaced to proper working order prior to contract WORK and be acceptable to the OWNER.

1.7 FINAL INSPECTION AND GUARANTEE

A. Inspection of work of lawns and planting will be made at conclusion of maintenance.

B. Final Acceptance: The CONTRACTOR shall notify the ENGINEER within 20 days of the date for final inspection at the end of the maintenance period and an inspection will be arranged within 15 days of this date. Before final acceptance, the terms of the plant guarantee must be met and the project site must be in the condition stipulated.

C. Sodded lawns will be acceptable provided requirements, including maintenance, have been complied with, and healthy, well-rooted, even-colored viable lawn is established, free of weeds, open joints, and bare areas (95 percent coverage required for acceptance). Where inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected by the ENGINEER and found to be acceptable. Remove rejected plants and materials promptly from project site.

D. Final acceptance of the WORK prior to guarantee period of the contract will be accepted upon written approval by the ENGINEER, on the satisfactory completion of all WORK, including maintenance, but exclusive of the replacement of plant material.

E. Any delay in the completion of any item of WORK in the planting operation which extends the planting into more than one season shall extend the correction period in accordance with the date of completion given above.

F. The CONTRACTOR shall replace, as soon as weather conditions permit, all dead plants and all plants not in a vigorous, thriving condition which are noted at the end of the one-year correction period.

G. Plants used for replacement shall be of the same size and variety specified in the plant list. Plants shall be furnished, planted, staked, and mulched as specified.

H. All WORK done under this contract shall be left in good order to the satisfaction of the OWNER and the ENGINEER and the CONTRACTOR shall, without additional expense to the OWNER, replace any trees, shrubs, etc., which develop defects or die during the one-year correction period.

1.8 MAINTENANCE AND GUARANTEE FOLLOWING ACCEPTANCE OF PROJECT

A. **General:** The CONTRACTOR shall be responsible for a period of one year after date of acceptance of all WORK under the Contract, for maintaining all plantings, including all

necessary plant or tree replacements, weeding, cultivating, fertilizing, pruning, controlling insects and diseases, re-guying, and performing all other operations incident thereto, as well as maintenance of the irrigation system specified in Section 32 84 00 – Planting Irrigation. The CONTRACTOR shall provide a written guarantee to the OWNER from the landscaping subcontractor, embodying the provisions of this Section of the Specifications.

B. The WORK covered by the maintenance and guarantee portions of these specifications consists of providing all replacements of plants, labor, materials, equipment, and supplies and in performing all operations in connection with maintenance and guarantees.

C. The inspection of lawn areas is independent of the final inspection and maintenance period. After the lawn has been accepted and has been mowed 4 or more times, the responsibility for mowing and irrigation will be turned over to the OWNER. However, the weeding, fertilizing, and controlling of diseases of the lawn areas shall remain the responsibility of the CONTRACTOR for the remainder of the one-year maintenance and correction period.

D. All planting, plant materials, and irrigation systems required under this contract shall be in a condition acceptable to the OWNER or its representative at the end of the maintenance guarantee period.

E. All water required during the maintenance and correction period will be furnished by the OWNER.

F. **Maintenance:** Watering and mowing of the lawn during the maintenance and correction period will be performed by the OWNER in accordance with written instructions which shall be furnished by the CONTRACTOR.

G. The CONTRACTOR shall make any changes or adjustments necessary to the automatic sprinkler system during the maintenance and correction period.

H. The CONTRACTOR shall replace any dead or diseased plants during the maintenance and correction period.

I. All lawn and planting areas shall be fertilized during the maintenance and correction period with 16-6-4 chemical fertilizer. Amount of fertilizer applied shall be per fertilizer's written instructions on bag. Fertilizers applied to planting areas shall be cultivated into the top 2 inches of topsoil.

J. The CONTRACTOR shall clean-up and remove unused or waste materials from the site and leave the area in a neat condition (satisfactory to the OWNER) whenever it performs work during the maintenance period.

K. **Final Inspection:** The OWNER and CONTRACTOR shall make a final inspection at the end of the one-year correction period. Any plants and materials found defective at time of final inspection shall be replaced within a time agreed upon by both parties.

L. Begin maintenance immediately after each plant is installed and continue to maintain for 8 weeks until the end of the guarantee period.

M. Perform the following operations: watering as often as required to maintenance capillary water within 2 inches of the soil surface around plants, weeding of plant beds, planting saucers to keep free of weeds using selective approved herbicide according to the MANUFACTURER's directions for use, and/or weeding by hand methods, mulching monthly to replenish mulch and keep at required 2-inch minimum depth, tightening and repairing guys to keep trees erect and supported without damage to bark, resettling plants to proper grades or upright position, restoration of planting saucers, seasonal spraying to control disease or insect pests that may impair plant vigor.

N. Remove and replace excessively pruned or malformed stock resulting from improper pruning.

O. Maintain lawns for not less than the period stated below, and longer as required to establish an acceptable lawn:

1. Sodded lawn, not less than 30 days after substantial completion.

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

PART 2 -- PRODUCTS

2.1 GENERAL EQUIPMENT REQUIREMENTS

A. All landscaping materials for soil conditioning, weed abatement, or planting shall be first-grade, commercial quality and shall have certificates indicating the source of material, analysis, quantity, or weight attached to each sack or container or provided with each delivery. Delivery certificates shall be given to the ENGINEER as each shipment of material is delivered. A list of the materials used, together with typical certificates of each material, shall be submitted to the ENGINEER prior to the final acceptance of the job.

2.2 TERMINOLOGY AND QUALIFICATIONS

A. Plants or plant material having characteristics not conforming to terms as defined will not be accepted. The terms "plant material" or "plants" refer to all vegetation, whether trees, shrubs, ground cover, or herbaceous vegetation.

B. Quality refers to structure and form, as evidenced by density and number of canes and branches, compactness, symmetry, and general development without consideration of size or condition. Standard quality indicates the least acceptable quality. Plants shall be typical of the species and variety of good average uniform growth, shall be well formed and uniformly branched, and shall have the minimum number of canes specified, free from irregularities, or shall conform to minimum quality index. Where the number of canes is not specifically stated in describing this grade, the standards of the "Horticultural Standards" as adopted by the American Association of Nurserymen, shall apply. In this case, the number of canes and other factors for the appropriate classification under "quality definition" in the Horticultural Standards shall be the Quality index. Plant material below this standard will be considered "culls" and are not acceptable. Plants shall be nursery grown.

C. Specimen means an exceptionally heavy, symmetrical, tightly-knit plant, so trained or favored in its development and appearance as to be outstanding, superior in form, number of branches, compactness, and symmetry.

D. Size is the factor controlled by dimensions representing height or spread, or both, without consideration of quality or conditions. For standard quality, a dimension is given for height or container size, or a dimension is given for height as well as container size.

E. Height is usually indicated with a tolerance. The smaller dimension is the minimum acceptable. The larger dimension represents the maximum permissible. The average dimension of all plants must equal the average of the tolerance figures shown on each item.

F. Condition is the factor controlled by vitality and ability to survive and thrive and be comparable with normal plants of the same species and variety in the vicinity, at the same season of the year. In addition, plants shall be free from physical damage or adverse conditions that would prevent thriving. Conditions also sometimes refer to state of growth, i.e., whether "dormant condition" or "growing condition" and this state shall be comparable to plants of similar species in the vicinity or leaves, formation of buds, and the like.

G. Cane means a primary stem which starts from the ground, or close to the ground, at a point not higher than 1/4 the height of the plant.

H. Caliper shall be taken 12 inches above the finish grade or ground, as a guide, or where a dimension in trunk appears to form the head of the tree.

I. Foliage line is maximum dimension in case of specimen plants. It measures from ground to lowest part of body of plant.

J. Collected plants shall not be used.

2.3 TOPSOIL

A. Topsoil shall be obtained from naturally drained areas and shall be fertile, friable loam suitable for plant growth. Topsoil shall be subject to inspection and approval at the source of supply and upon delivery. Top soil may be obtained from the required excavation of the site given that it either naturally meets, or is treated by the CONTRACTOR to meet, the requirements of this section.

B. The topsoil shall be of uniform quality, free from subsoil stiff or lumpy clay, hard clods, hardpan, rocks, disintegrated debris, plants, roots, seeds, and any other materials that would be toxic or harmful to plant growth. Topsoil shall contain no noxious weeds or noxious weed seeds.

C. The topsoil shall contain at least 3 to 5 percent organic matter as determined by loss of weight after ignition of dried (moisture-free) samples in accordance with current methods of the Association of Official Agricultural Chemists.

D. The acidity range of the topsoil shall be (pH 5.5 to pH 7.5). The salinity level shall be less than 3 millimhos/cm.

E. Clay, as determined by the Bouyoucous hydrometer or by the decantation method, shall not exceed 5 to 25 percent of the topsoil material.

F. Mechanical analysis shall be performed and shall conform to ANSI/ASTM D 422.

G. Soil mix for interior plants shall be sphagnum moss or an approved soil mix furnished in bags or other standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. The soil mix shall be a mix designed specifically for interior container or potted planting.

H. If topsoil is not available on-site, it must be furnished as specified. Throughout all parts of site where finish grades and contour lines differ from existing contour lines, bring to finish grade contours shown on "Grading Plan".

I. Topsoil shall be friable fertile soil with representative characteristics of area soils. It should be free of heavy clay, silt, stone, extraneous lime, plant roots, and other foreign matter greater than 1-1/2 inches in diameter. It shall not contain noxious plant growth (such as bermuda or nut grass). It shall test in neutral pH range of 5.0 to 6.75 and contain no toxic substance that can be deemed to impeded plant growth. The CONTRACTOR shall supply sufficient amounts of the topsoil to the ENGINEER for testing. Testing expenses shall not be borne by the CONTRACTOR. Topsoil shall comply with the following quantitative analysis.

Volume Measure Particle Size Components	Percent	Millimeter
Organic Matter	3 to 5	0.05 to 0.002
Silt	10 to 30	0.02 to 0.05
Sand	25 to 75	0.002 and below

2.4 FERTILIZER AND ADDITIVES

A. If necessary to bring soil into above specified limits:

1. **Lime:** Natural limestone (Dolomite) containing not less than 85 percent of total carbonates, ground so that not less than 90 percent passes a 10-mesh sieve and not less than 50 percent passes a 100-mesh sieve.

2. **Peat Humus or Peat Moss:** Texture, moisture and pH range suitable for intended use.

3. **Commercial Fertilizer:** A complete plant food containing 20 percent nitrogen, 26 percent available phosphoric acid, and 6 percent potash, conforming to applicable state fertilizer laws, availability of plant nutrients conforming to standards of the Association of Official Agricultural Chemists (AOAC), uniform in composition, dry, free-flowing, and delivered in original, unopened containers bearing manufacturer's guaranteed analysis.

   a. For trees, palms, and shrubs, provide fertilizer with not less than 6 percent available phosphoric acid, 6 percent nitrogen, and 6 percent soluble potash.

B. Fertilizer shall be furnished in bags or other standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon.

C. Chemical fertilizers shall be a mixed commercial fertilizer conforming to FS O-F-241D, Type I, with percentages of nitrogen, phosphoric acid, and potash at 20-26-6. The combined N-P-K content shall be following percentages of total weight: 5 percent nitrogen, 10 percent phosphoric acid and 5 percent potash. Fertilizers shall be uniform in composition, dry, and free flowing.

D. Tablets shall be 12 grams each 20-10-5, **"Agriform," "Lesslie," or approved equal.**

E. Agricultural gypsum shall be approved standard brand agricultural calcium sulfate (CaSO4) as applied to soils and shall contain 19 percent combined sulfur.

2.5 PLANT MATERIALS

A. Plants shall meet requirements of the Contract Documents and shall be in accordance with the botanical names and applicable standards of quality, size, condition, and type. They shall be true to name, genera, species, and variety in accordance with reference publications.

B. Plant names are defined in "Standardized Plant Names" and "Bailey's Encyclopedia of Horticulture." When a name is not found in either reference, the accepted name used in the nursery trade shall apply.

C. Plants shall be marked for identification. Each bundle of plants and at least 25 percent of each species and variety of separate plants in any one shipment shall have legible labels securely attached before delivery to the site.

D. All trees and shrubs shall be measured while their branches are in their normal position. Height and spread dimensions specified refer to the main body of the plant and not from branch or root tip to tip. No trees will be accepted with their leaders cut, or so damaged that cutting is necessary.

E. All plants shall be symmetrical and shall conform to the size, age, and condition as specified on the plant list shown in the Contract Documents. Exceptions are as follows:

1. Plants larger than specified in the plant list may be used if approved by the ENGINEER, but use of such plants shall not increase the contract price. If the use of larger plants is approved, the spread of roots or ball earth shall be increased in proportion to the size of the plant. Bare root plants furnished in size greater than specified shall be balled and burlapped when required by the ENGINEER.

2. Where caliper or other dimensions of any plant materials are omitted from the Plant List, it shall be understood that such plant materials shall be normal stock for type listed.

F. Plants shall be of sound health, vigorous, and free from plant disease and shall be well-branched, shall have full foliage when in leaf, and shall have a healthy well-developed normal root system. Cold storage plants will not be accepted. Plants that are sensitive to

shock from elevation change shall be grown at elevations close enough to site to alleviate any plant damage due to such change for at least 2 years.

G. The following abbreviations as used in Specification shall mean:

1. B&B - Balled and burlapped

2. BR - Bare root

3. CG - Container grown

4. BP - Balled, burlapped, and fixed to platform

H. Bare rooted (BR) plants shall have well-developed branch systems and vigorous root systems. They shall be dug to sufficient depth to insure full recovery and development of the plants. Roots of these plants shall be covered with a uniformly thick coating of mud being puddled immediately after they are dug.

I. Balled and burlapped (BB) plants shall have firm, natural balls of earth, or diameter not less than that specified and of sufficient depth to include all the fibrous and feeding roots. No plant moved with a ball will be accepted if the ball is cracked or broken before or during plant operations, except on special approval of the ENGINEER.

J. Roots or balls of all plants shall be adequately protected at all times from sun and/or drying winds.

K. Plants (indicated to be in marked cans, pots, or other containers on the plant list) shall have been grown in the containers for a minimum of 6 months and a maximum of 2 years. Roots shall fill the containers but show no evidence of being or having been root bound.

L. Trees shall have straight trunks and all old abrasions and cuts shall be completely callused over. In no case shall trees be topped before delivery.

M. Plants shall have been transplanted or root-pruned at least once in the 2 years. Plants shall not be pruned prior to delivery except as authorized by the ENGINEER.

2.6 SEED MIXTURES

A. All seed shall conform to applicable City, County, State, and Federal regulations. Seed shall be mixed by dealer. The CONTRACTOR shall furnish dealer's guaranteed germination of each variety. Grass seed shall not be delivered to the site until samples have been approved in writing by the ENGINEER or his authorized landscape representative. Approval of samples, however, shall not affect the right of the ENGINEER, or the authorized landscape representative to reject seed upon or after delivery. Seed which has become wet, moldy, or otherwise damaged prior to use will not be accepted.

B. Grass shall be fresh, clean, and new-crop seed, composed of the following varieties mixed in the proportions by weight, as shown, and tested for the minimum percentage of purity and germination specified.

Common Names	By Weight	Proportion Purity (percent)	Germination
Type 1: Bahia	100	90	90

2.7 SOD GRASS

A. Provide St. Augustine "Floratum" grass sod from a certified sod farm.

B. Sod shall be strongly rooted, free of pernicious weeds, mow to a height of 3 inches below lifting, deliver to the site in strips 12 inches wide at least 3 feet long, rolled, and with a uniform thickness between 3/8 inch and 5/8 inch of soil.

C. **Delivery and Protection of Sod:**

1. Deliver sod immediately on lifting and after lawn bed is prepared for planting.

2. Give advance notice to ENGINEER of days on which deliveries of sod will be made.

3. Protect sod from drying by covering during delivery to protect from sun and wind.

2.8 WOOD EDGING

A. Wood edging shall be 2-inch x 4-inch redwood construction heart stock.

2.9 STAKING MATERIALS

A. Stakes and Guys: When required provide stakes and deadmen of sound new hardwood, treated softwood, or redwood, free of knot holes and other defects. Provide wire ties and guys of 3-strand, twisted, pliable galvanized iron wire not lighter than 12 gage with zinc-coated turnbuckles. Provide not less than 1/2-inch hose, cut to required lengths to protect tree trunks from damage by wires.

B. Hose for covering wire shall be new or used black or green 2-ply fiber-bearing garden hose, not less than 1/2-inch inside diameter.

C. Wire for tree bracing and guying shall be double strand pliable No. 10-gage galvanized steel wire or vinyl-coated steel wire.

D. Tree ties of other materials may be used with prior approval of ENGINEER.

2.10 MISCELLANEOUS MATERIALS

A. Wrapping material for trees, 2-inch diameter or larger, shall be 2 thicknesses of crinkled paper cemented together with bituminous material in strips 4-inch wide. Twine for tying shall be medium or coarse sisal yarn with a light impregnation of oil condensate from asphalt or tar.

B. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations and outline areas and secure the ENGINEER's acceptance before start of planting WORK. Make adjustments as may be required.

PART 3 – EXECUTION

3.1 GENERAL

A. The landscape work shall not be performed at any time when it may be subject to damage by climatic conditions.

B. The CONTRACTOR shall carefully scale or otherwise verify all dimensions in the Contract Documents. Dimensions and plant locations shown shall be coordinated with ENGINEER and final location shall be site-oriented by the planter and ENGINEER. Any discrepancies or inconsistencies discovered shall be brought to the attention of the ENGINEER.

C. In case of conflict between the plant list totals and total plant count of the Contract Documents, the CONTRACTOR shall provide the higher number of plants.

D. Delivery of materials may begin only after samples and tests have been approved by the ENGINEER. All materials furnished for the WORK shall be not less than the approved sample.

E. Substitutions for the indicated plant materials may be permitted pursuant to the Contract Documents.

F. The CONTRACTOR shall provide temporary fencing, barricades, covering, or other protections to preserve existing landscaping items indicated to remain and to protect the adjacent properties and other structures when they may be damaged by the landscape work.

G. Trees and vegetation to be protected as shown on the Drawings.

H. The following minimum standards for trees and vegetation protection shall be applied to any area designated for protection:

1. Protection of Individual Trees: A suitable protective barrier, constructed of metal, wood, or other durable material, shall be placed around individual protected trees at a distance of 6 feet of greater, or at a distance of the radius of the dripline of all protected existing trees, whichever is greater.

2. Supplemental Vegetation Protection Standards: In addition to the minimum standard established above, supplemental standards may be imposed by the ENGINEER as a special condition of a vegetation removal permit. These supplemental standards shall be based upon the suggested standards in the latest edition of the Tree Protection Manual for Builders and Developers published by the Division of Forestry of the Florida Department of Agriculture and consumer Affairs, or similar recognized reference manual.

I. The CONTRACTOR shall retain the services of a tree surgeon approved by the ENGINEER to repair damage to existing trees. Existing trees which are to be saved and which cannot be restored to full growth, as determined by tree surgeon, shall be removed and replaced with a new similar tree of 24-inch box size unless otherwise approved by the ENGINEER.

J. The CONTRACTOR shall remove and/or relocate landscape items such as trees, shrubs, grass, other vegetation, improvements, and obstructions as shown on Drawings or otherwise specified.

K. Waste materials shall be removed and disposed of off the OWNER's property, unless otherwise indicated.

L. It shall be the responsibility of the CONTRACTOR to avail itself of any information regarding utilities which are in the area of work and to prevent damage to the same. The CONTRACTOR shall provide protection to the utilities as necessary.

M. Burning of combustible materials on the site shall not be permitted.

N. The CONTRACTOR shall provide protection to structures, sidewalks, pavements, and other facilities in areas of work which are subject to damage during landscape work. Open excavations shall be provided with barricades and warning lights which conform to the requirements of governing authorities and the State's OSHA safety requirements from dusk to dawn each day and when needed for safety.

O. Planting areas include all areas to be landscaped unless, specified or shown, otherwise.

3.2 SOIL PREPARATION

A. The landscape WORK shall not begin until all other trades have repaired all areas of settlement, erosion, rutting, etc., and the soils have been re-established, re-compacted, and refinished to finish grades. The ENGINEER shall be notified of all areas which prevent the landscape work from being executed.

B. Areas requiring grading by the landscaper including adjacent transition areas shall be uniformly level or sloping between finish elevations to within 0.10-ft above or below required finish elevations.

C. The landscape work shall not proceed until after walks, curbs, paving, edging, and irrigation systems are in place. The contract operations shall be completed to a point where the landscape areas will not be disturbed. The subgrade shall be cleaned free of waste materials of all kinds.

D. During grading waste materials in the planting areas such as weeds, rocks (2 inches and larger) building materials, rubble, wires, cans, glass, lumber, sticks, etc., shall be removed from the site. Weeds shall be dug out by the roots.

E. Fertilizers, additives, seed, peat, etc. subject to moisture damage shall be kept in a weatherproof storage place in such a manner that they will be kept dry.

F. **Preparation of Subgrade:** After rough grading is completed and before topsoil is spread, thoroughly scarify ground to a minimum depth of 6 inches with a toothed ripping machine by running in two directions at right angles over the entire surface to be planted. Limit preparation of subgrade to areas to be planted immediately.

G. **Preparation of Topsoil:**

1. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous material harmful or toxic to plant growth.

2. Mix specified soil amendments with topsoil at rates required to meet specification. Delay mixing of planting mix if planting will not follow placing of topsoil within 1 week.

3. For planting beds, mix topsoil either prior to planting or apply on surface and mix thoroughly before planting.

H. **Spreading of Topsoil:** Spread natural or prepared topsoil over the prepared rough grade to a minimum depth of 4 inches.

I. **Fertilizing:** Apply commercial fertilizer at the rate of 50 pounds per 10,000 square feet distributing uniformly with a mechanical spreader, or at a rate determined from soil test.

J. **Finish Grading:**

1. 1. Rake the top soiled area to uniform grade so that all areas drain, as indicated on the grading plan.

2. Remove all trash and stones exceeding 2 inches in diameter from area to a depth of 2 inches prior to preparation and planting areas.

K. After removal of waste materials the planting areas subgrade shall be scarified and pulverized to a depth of not less than 6 inches and all surface irregularities below the cover of topsoil removed.

L. Finish grading shall consist of:

1. Final contouring of the planting areas.

2. Placing 4 inches of topsoil over all areas to be planted unless shown or specified otherwise.

3. Placing all soil additives and fertilizers.

4. Tilling of planting areas.

5. After tilling, bring areas to uniform grades by floating and/or hand raking.

6. Making minor adjustment of finish grades as directed by the ENGINEER.

7. Removing waste materials such as stones, roots, or other undesirable foreign material and raking, disking, dragging, and smoothing soil ready for planting.

M. Any unusual subsoil condition that will require special treatment shall be reported to the ENGINEER.

N. Topsoil shall be uniformly distributed over all areas where required. Subgrade and topsoil shall be damp and free from frost.

O. Surface drainage shall be provided as shown by molding the surfaces to facilitate the natural run-off of water. Low spots and pockets shall be filled with topsoil and graded to drain properly.

P. Finish grade of all planting areas shall be 1-1/2 inches below finish grades of adjacent pavement of any kind.

Q. In all shrub planting areas, 1-1/2 inches of peat moss or soil-aid shall be raked into the top 3 inches of soil.

3.3 DELIVERY, STORAGE, AND HANDLING OF PLANT MATERIALS

A. No plants other than the required samples shall be dug or delivered to the site until the required inspections have been made and the plant samples are approved.

B. Plants shall not be pruned prior to delivery except upon approval by the ENGINEER.

C. Plant material shall be planted on the day of delivery if possible. The CONTRACTOR shall protect the stock in a temporary nursery at the project site where it shall be protected from sun and drying winds and shall be shaded, kept moist, and protected with damp soil, moss, or other acceptable material. Plants shall be planted within 2 days after delivery.

D. All balled and burlapped plants which cannot be planted immediately in delivery shall be set on the ground and shall be well protected with soil, wet moss, or other acceptable material. Bare rooted plants, which cannot be planted immediately, shall be planted on heeled-in trenches immediately upon delivery. No material heeled-in more than one week may be used. Bundles of plants shall be opened and the plants separated before the roots are covered. Care shall be taken to prevent air pockets among the roots.

E. During planting operations, bare roots shall be covered with canvas, wet straw, or other suitable materials. No plants shall be bound with wire or rope at any time so as to damage the bark or break branches.

F. Plants shall not be picked up or moved by stem or branches, but shall be lifted and handled from the sides of the containers.

G. Plants shall be lifted and handled from the bottom of the ball or container. Plants with balls cracked or broken before or during planting operations will not be accepted and shall be immediately removed from the site.

3.4 TREE AND PLANT LOCATIONS

A. The CONTRACTOR shall locate and stake all tree and shrub locations and have the locations approved by the ENGINEER before starting excavation for same. The plant locations shall be observed, and their locations shall be adjusted as directed by ENGINEER before final approval.

B. No trees shall be located closer than 72 inches to structures unless otherwise shown. Ground covers and shrubs may be planted up to structures or curbs.

3.5 PLANT PITS

A. Plant pits, centered on location stakes, shall be excavated circular pits with vertical sides and flat or saucer shape bottom in accordance with the following sizes unless shown otherwise:

1. Tree pits shall be at least 2 feet greater in diameter than the specific diameter of ball or spread of roots, and at least 6 inches below depth of ball or roots. A 3-inch layer of manure shall be worked thoroughly to a depth of 6 inches below the pit bottom.

2. Shrubs shall be planted in pits or holes of soil 24 inches deep below finished grade, or as much deeper as necessary to properly set the plant at finished grade with a minimum of 6 inches of planting soil under balls of all plants. Shrubs with balls shall be planted in pits that are at least 24 inches greater in diameter than the bottom of ball. Bare root shrubs shall be planted in pits at least 12 inches below the roots of the plant.

3.6 PREPARED BACKFILL

A. Tree and shrub pit backfilling soil shall consist of 4 parts topsoil, and 1 part peat or soil-aid by volume. Commercial fertilizer shall be sparingly mixed with the prepared topsoil, using 5 lb/cu yd or as required by manufacturer's printed recommendations.

B. Planting pit, bin, and trench filling and bedding soil shall consist of 4 parts by volume topsoil mixed with 1 part manure and 5 lb of commercial fertilizer per cubic yard.

C. Materials shall be thoroughly rotary-mixed on the site before placement. Mixing of materials in pits, bins, trenches or beds will not be permitted.

D. Tree and shrub pits shall be provided with fertilizer tablets as follows:

1. 1 per one-gallon can plant

2. 3 per 5-gallon can plant

3. 5 per 15-gallon can plant

3.7 ROCKS OR UNDERGROUND OBSTRUCTIONS

A. In the event that rock or underground obstructions are encountered in the excavation of plant pits, alternative locations shall be selected by the ENGINEER. Moving of trees to alternative locations shall not entail additional costs to the OWNER.

3.8 SETTING PLANT MATERIALS

A. The soil shall not be worked when the moisture content is so great that excessive compaction will occur, nor when it is so dry that a dust will form in the air or that clods will not break readily. Water shall be applied if necessary to provide ideal moisture for filling and for planting as herein specified.

B. Plants shall be set in center of pits as shown in the Contract Documents. They shall be set plumb and straight, and at such a level that after settlement that the crown of the plant will be 2 inches above the finished grade.

C. Balled and burlapped trees shall have planting soil placed and compacted around base of ball to fill all voids. All burlap ropes or wires shall be removed from the sides and tops of balls.

D. Roots of bare root plants shall be properly spread out and planting soil carefully worked in among them. All broken or frayed roots shall be cut off clean.

E. All vines shall be removed from stakes, untied, and securely fastened in an approved manner to wall or fence next to which they are planted.

F. All ground cover plants shall be evenly spaced, staggered in rows, and set at intervals specified, so as to produce a uniform effect. Plants shall be watered immediately after planting operations have been completed.

G. All shrubs and vines shall be pruned to remove damaged branches. All bare root shrubs shall be pruned and shaped to compensate for transplant root loss.

H. Planting soil around roots or balls shall be thoroughly compacted and watered. After planting, the soil in the shrub beds shall be cultivated between shrubs, raked smooth, and neatly outlined. Muddy soil shall not be used for backfilling. All broken or frayed roots shall be properly cut off.

I. Trees and shrubs on slopes steeper than 6 to 1 shall be provided with watering dams or berms at least 6 inches high and 8 inches wider than planting pit (hole) unless specified or shown otherwise.

J. All trees shall be thoroughly watered immediately after planting.

K. Remove all tags and labels when directed by ENGINEER.

L. Trees shall have trunks wrapped in acceptable tree wrap material from base up to and above at least the second scaffold branch.

3.9 STAKING

A. Staking of trees shall be done immediately after they are planted. Plants shall stand plumb after staking. Staking shall be as specified unless shown or indicated otherwise.

B. Trees of 2-inch caliper and over shall be guyed at points of branching with 3 wire guys spaced equally around and outside the perimeter of the ball. Guy wires shall be covered with rubber hose at the bark, protected by approved material at points of contact. Each guy shall be positioned below crotches and fastened to a 4-inch diameter by 18-inch wood deadman, 12 inches below grade. One turnbuckle shall be provided for each guy.

C. Trees less than 2-inch caliper shall be supported by 2 stakes placed diametrically opposite at perimeter line of ball and to sufficient depth to hold tree rigid. Stakes shall be driven vertically and not twisted or pulled. Trees shall be wired to each stake as indicated on

staking details. Trees shall be protected with rubber hose over wires at points of contact. All evergreen trees shall be guyed.

3.10 PRUNING AND MULCHING

A. Each tree and shrub shall be pruned in accordance with standard horticultural practice to preserve the natural character of the plant in the manner fitting its use in the landscape design, as approved by the ENGINEER.

B. All dead wood or suckers and all broken or badly bruised branches shall be removed by thinning out and shortening branches. Deciduous bare-rooted plants shall have not less than 1/3 of their respective leaf surfaces removed. All cuts shall be made just above a healthy bud. Pruning shall be done with clean, sharp tools.

C. Cuts over 3/4-inch diameter shall be painted with an approved tree paint. Paint shall cover all exposed cambium as well as other living tissue. Paint shall be waterproof, adhesive, and elastic antiseptic; shall be free from kerosenes, coal tar, creosote, or other materials injurious to the life of the tree; and shall be approved before it is used.

D. Plants shall be mulched after planting and cultivating have been completed. A layer of mulch materials, as hereinbefore specified, shall be spread on finished landscaping grade within all planting areas to a depth of 2 inches. The mulch around isolated plants shall be 6 inches greater in diameter than the planting hole. All shrub and ground cover beds shall be completely covered with the mulch.

E. All deciduous tree trunks shall be thoroughly sprayed with a methoxychlor or similar insecticide, and wrapped immediately after planting, with wrapping material overlapping (1-1/2 inches, wound from ground line to the second branch, and securely taped in at least 5 places, including the top, middle, and bottom).

3.11 SODDING

A. Grass sod shall be provided where shown or specified and shall be maintained.

B. The soil shall be prepared and fertilized before sodding. The CONTRACTOR shall prepare only enough ground that can be planted within 24 hours thereafter.

C. Soil preparation shall consist of the following:

1. Preparation of sub-grade grading shall be per "Part 3 – Execution" in Paragraphs entitled "General" and "Soil Preparation," herein.

2. Finish grading shall be per "Part 3 – Execution" in Paragraph entitled "Soil Preparation," herein. Topsoil required at areas to be sodded shall be 1-1/2 inches. The soil additives and fertilizer for finish grading shall consist of mulch at 5 cu yd/1000 sq. ft and commercial fertilizer at 20 lb/1000 sq ft.

D. Sod shall be cut and laid on site the same day.

E. The sod shall be placed over leveled, compacted, and prepared finish graded soil. The topsoil and sub-base shall be moist enough to resist shifting.

F. The surface on which the sod is to be laid should be firm and free from footprints or other depressions. A string or line of boards may be used as a guide for setting the first line of sod across the area. Sods of the next course are matched against the edge of this first line in such a way the joints between the individual sod pieces in the 2 lines do not coincide. Successive courses are matched against the last line laid, in the same manner. Sod shall be laid on indicated areas.

G. Sod joints shall be closely laid and filled with a mixture of grass seed and screened topsoil at the rate of 2 lbs. of seed to each cubic yard of topsoil. Sod fill soil shall be thoroughly tamped to a true and even surface at the required finished grade.

H. Sod shall always be laid across slopes.

I. All new sod shall be rolled or firmly but lightly, tamped with a suitable wooden or metal tamper, sufficiently to set or press sod into underlying soil.

J. After sodding has been completed, the sodded area shall be cleaned up and thoroughly moistened by sprinklers.

3.12 SEEDING-GENERAL

A. Grass seeds shall be provided where lawn is shown or indicated and shall be maintained.

B. The soil shall be prepared and fertilized before seeding or shall be prepared per hydro-seeding instructions. The CONTRACTOR shall prepare only enough ground that can be planted within 24 hours thereafter.

C. Soil preparation shall consist of the following:

1. Preparation of sub-grade grading shall be per Paragraphs entitled "General" and "Soil Preparation," respectively, herein.

2. Finish grading of soil per Paragraph entitled "Soil Preparation", herein. The soil additives and fertilizer for finish grading shall consist of mulch at 5 cu yd/1000 sq ft and commercial fertilizer at 20 lb/1000 sq ft.

D. Sow seed at the rate of 2 lbs to 1000 sq ft of area. Equal quantities of seed shall be sown in the directions at right angles to each other to produce an even distribution of seed over the entire area.

E. No seeding shall be done when wind velocity exceeds 4 mph, within 24 hours after rain, or if the surface has been compacted, without first loosening the ground.

F. The seed shall then be covered with a fine layer of soil to a depth not greater than 1/4-inch.

G. All lawn areas shall be covered with sphagnum peat moss or clean straw uniformly at a rate of 1-1/2 standard bales per 1000 sq ft.

H. After covering the seeds with soil and peat or straw, the planted area shall be rolled in 2 directions with a 200-lb roller or other roller designed for lawn seeding.

I. All lawn slopes greater than 5 percent, or places where erosion is a problem, shall be mulched with straw at a rate of 2 bales per 1000 sq ft.

J. This seeding method may be utilized if weather conditions allow as determined by the ENGINEER.

3.13 MISCELLANEOUS ITEMS

A. Wood chip mulch shall be placed in all shrub areas where shown, spread carefully and evenly to a minimum depth of 4 inches over planted areas.

END OF SECTION

SECTION 32 91 13– SOIL PREPARATION

PART 1 -- GENERAL

1.1 THE SUMMARY

A. Work included: soil preparation; berm preparation; fertilizing; topsoil; grading; testing.

B. Related work herein:

1. Special Conditions

2. Section 32 90 00 – Planting

C. Landscape CONTRACTOR of record to be provided to OWNER within 90-calendar days or contract execution.

1.2 QUALITY ASSURANCE

A. Testing Agency: INDEPENDENT TESTING LABORATORY, OR Florida Cooperative Extension Service or Florida Department of Agriculture, Division of Plant Industry.

B. Requirements of regulatory agencies: conform to requirements of City, County, and State Agencies.

1.3 CONTRACTOR SUBMITTALS

A. Test Reports: results of soil analysis.

B. Certificates: testing laboratory certificate that content of soil conditioners meet specifications requirements.

C. Soil samples and product labels for specified fertilizers and soil conditioners.

1.4 PROJECT/SITE CONDITIONS

A. Protection: protect and avoid damage to existing walks, pavements, curbs, and any existing site improvement.

PART 2 -- PRODUCTS

2.1 SOIL

A. Planting Soil (backfill material) – specified planting soil for trees and palms shall be a mixture of 50% bio-solids co-compost and 50% topsoil (sandy loam). Mixture shall use indigenous materials only and be manufactured specifically for backfill planting of trees and palms. Bio-solids co-compost shall be "AllGro" (screened to ½" maximum size) or approved equivalent.

1. Bio-solids co-compost shall consist of a stabilized mixture of ground yard trimmings and bio-solids processed according to State of Florida Department of Environmental Protection Guidelines for the Processing and Distribution of Sewage Sludge

Compost. Composted bio-solids shall only be obtained from facilities operating in compliance with a valid permit for the composting of bio-solids, producing a Class AA residual product, and storing product on a pad with a current nematode certification from Florida Department of Agriculture.

2. "AllGro" or the equivalent composted bio-solids, shall have the following characteristics:

   a. Screened to ½" maximum particle size

   b. Weed free

   c. Moisture content: 50% by weight maximum

   d. Water holding capacity: 200% by weight minimum

   e. Carbon to nitrogen ratio: less than 25:1

   f. Organic matter content: 40% by dry weight minimum

   g. Soluble salts: less than 3 mmhos / cm

   h. pH: 7.0 to 7.9

   i. Stability (respiration / CO2 evolution): 4.0 maximum

   j. Minimum nutrient levels as follows:

      1) Macro nutrients

         a) Nitrogen (N) – 1.0% minimum, water insoluble nitrogen 90% minimum

         b) Phosphorous (P) - .05% minimum

         c) Potassium (K) – 0.2% minimum

      2) Other macro and micro nutrients

         a) The compost shall contain levels of those micronutrients necessary for plant growth. These include Calcium, Magnesium, Sulfur, Boron, Copper, Iron, Manganese, and Molybdenum.

      3) Compost not meeting these requirements will not be accepted.

3. Topsoil shall be fertile, friable, without mixture of subsoil materials, and obtained from a well-drained, arable site with representative characteristics of area soils (sandy loam texture). It shall be free from heavy clay, limerock, shellrock, stones, lumps, plants, roots, or other foreign material or noxious grass (such as Bermuda or nut grass) and noxious weeds. It shall not contain toxic substances which may be harmful to plant growth. The pH range shall be 5.0 to 7.0 inclusive. CONTRACTOR may be required to submit results of soil test for topsoil proposed for use under this Contract for approval by the OWNER's Representative.

4. Berm fill materials: Soil materials for Berm shall be free of rock or gravel larger than one (1 inch) in any dimension, debris, waste, vegetable, muck, marl, and other deleterious matter. Use excavated or borrow material that has been sampled, tested and certified as satisfactory soil material.

B. The planting soil shall be sampled and tested for pH value (as determined in accordance with ASTM E 70) and shall be between 5.0 and 7.0 inclusive. The desired pH shall be achieved by applying fertilizer (Aluminum sulfate) or dolomitic limestone, in quantities necessary to adjust the pH to the specified range.

C. Maximum soluble salts for any specified soil materials: 550 ppm.

D. Soil mixtures shall be free of weeds, plants, seeds, insects, nematodes, or any undesirable materials, before delivery to the site. Sterilization shall not affect viability of soil to new plant material

2.2 SOIL CONDITIONERS

A. Dolomitic limestone: approved product, designated for agriculture use.

B. Aluminum sulfate: manufacturer's standard commercial grade.

C. Pesticides: as recommended by Florida State and County Agricultural Agencies. To be approved by the OWNER's Representative before use.

D. Diehard TM transplant – one step – use in accordance with supplier's instruction and recommendations.

E. Fertilizer: commercial grade fertilizer to comply with State of Florida fertilizer laws with at least 50% of the nitrogen derived from natural organic sources and all potash to be derived from sulfate forms. The following minor elements should be included:

32.2% ZnO	0.25% CuO
4.0% MgO	0.005% Fe203
0.5% MnO	0.1% B203

F. Soil sterilizers: as recommended by the State and local agricultural agencies. Sand: clean, sharp builder's sand and free of substances harmful to growth of plants.

PART 3 – EXECUTION

3.1 PREPARATION

A. The landscape work shall not begin until all other trades have repaired all areas of settlement, erosion, rutting, etc., and the soils have been established, re-compacted, and refinished to finish grades. The landscape architect shall be notified of all areas which prevent the landscape work from being executed.

B. Areas requiring grading by the landscaper including adjacent transition areas shall be uniformly level or sloping between finish elevations to within 0.10-ft above or below required finish elevations.

C. The landscape work shall not proceed until after walks, curbs, pavings, edging, and irrigation systems are in place. The contract operations shall be completed to a point where the landscape areas will not be disturbed. The subgrade shall be cleaned free of waste materials of all kinds.

D. During grading, waste materials in the planting areas such as weeds, rocks (2 inches and larger) building materials, rubble, wires, cans, glass, lumber, sticks, etc. shall be removed from the site. Weeds shall be dug out by the roots.

E. Fertilizers, additives, seed, peat, etc. subject to moisture damage shall be kept in a weatherproof storage place in such a manner that they will be kept dry.

F. After removal of waste materials, the planting area subgrade shall be scarified and pulverized to a depth of not less than 6 inches and all surface irregularities below the cover of topsoil removed.

G. Finish grading shall consist of:

1. Final contouring of the planting areas.

2. Placing planting soil (backfill material) over all areas to be planted unless shown or specified otherwise. Placing 2 inches of topsoil over all areas to be sodded.

3. Placing all soil additives and fertilizers.

4. Tilling of planting areas. A minimum of 6-8" in depth.

5. After tilling, bring areas to uniform grades by floating and/or hand raking.

6. Making minor adjustment of finish grades as directed by the landscape architect.

7. Removing waste materials such as stones, roots, or other undesirable foreign material and raking, disking, dragging, and smoothing soil ready for planting.

H. Any unusual subsoil condition that will require special treatment shall be reported to the landscape architect.

I. Topsoil shall be uniformly distributed over all areas where sod is required. Topsoil shall be as described above.

J. Surface drainage shall be provided as shown by molding the surfaces to facilitate the natural run-off of water. Low spots and pockets shall be filled with topsoil and graded to drain properly.

K. Finish grade of all planting areas shall be 1-½ inches below finish grades of adjacent pavement of any kind.

END OF SECTION

SECTION 32 92 23– SODDING

PART 1 -- GENERAL

1.1 THE SUMMARY

A. Work included: prepare finish grades for sod, deliver and install sod, maintain sod.

B. Related Work

1. Special Conditions

2. Section 32 91 13 – Soil Preparation

1.2 QUALITY ASSURANCE

A. Standards: Federal Specification (FS) 0-F-241q(1), Fertilizer mixed, Commercial.

B. Testing Agency: Independent Testing Laboratory.

C. Requirements of State and Local Regulatory Agencies: Materials shall conform to the requirements established by the State Department of Agriculture.

1.3 CONTRACTOR SUBMITTALS

A. Certificates:

1. Growers Certification:

a. Grass species, location of field from which sod is cut, and date of cutting.

b. Compliance with State and Federal quarantine restrictions.

2. Manufacturer's certification of fertilizer and herbicide composition and application rates.

1.4 PRODUCE DELIVERY, STORAGE, AND HANDLING

A. Deliver sod on pallets.

B. Protect roots from exposure to wind or sun.

C. Protect sod against dehydration, contamination and heating during transportation and delivery.

D. Do not deliver more sod than can be installed within 24 hours

E. Keep stored sod moist and under shade or covered with moistened burlap.

F. Do not stack sod more than 2' deep.

G. Do not tear, stretch, or drop sod.

1.5 JOB CONDITIONS

A. Begin installation of sod only after preceding related work is accepted by the Owner's representative.

B. Environmental Requirements:

1. Install sod during months acceptable to common industry practice.

2. DO NOT INSTALL SOD UNTIL IRRIGATION SYSTEM CAN PROVIDE IMMEDIATE WATERING OF SODDED AREAS.

C. Protection: Erect signs and barriers against excessive pedestrian or vehicular traffic.

1.6 GUARANTEE

A. Guarantee sod for period of ninety (90) days after date of final acceptance by Owner's representative.

B. Replacement sod under this guarantee shall be guaranteed for ninety (90) days after date of final acceptance by Owner's representative.

C. Repair damage to other plants during sod replacement at no cost to Owner.

PART 2 -- PRODUCTS

2.1 SOD

A. Grass Species:

1. Stenotaphrum secundatum "St. Augustine – 'Floratam'".

2. Paspalum notatum "Bahia Grass"

3. Cynodon dactylon "Bermuda 419"

B. American Sod Producers Association (ASPA) Grade: Nursery Grown or Approved equal.

C. Furnished in pads of the following dimensions:

1. Size:

a. Length: 24"

b. Width: 16"

c. Thickness: 1-1/2" excluding top growth and thatch.

2. Grown in native, completely organic "muck" soil, with minimum 1-1/2" soil intact on all roots; not stretched, broken, or torn.

D. Uniformly mowed height when harvested:

1. St. Augustine: 2-1/2"

2. 419 Bermuda – 1/1/2"

E. Thatch: Maximum ½" uncompressed.

F. Inspected and found free of diseases, nematodes, pests and pest larvae, by entomologist of State Department of Agriculture.

G. Weeds: Free of torpedo grass, Bermuda grass, nut grass or any other species of plant other than that specified.

H. Dense, well developed root systems; stems uniform in color, leaf texture and density.

2.2 WATER

A. Free of substance harmful to plant growth; free from chemicals or minerals that stain or discolor.

2.3 FERTILIZER

A. Provide commercial grade fertilizer uniform in composition, dry and in a free-flowing condition for application by suitable equipment, delivered in unopened bags or containers, each fully labeled and complying with Florida state fertilizer laws.

B. LESCO INC. 12-2-14 Turf Fertilizer; 50% polymer coated, slow-release nitrogen to include minor elements (or approved equal).

2.4 HERBICIDES

A. ROUNDUP as manufactured by Monsanto Company and approved by the State Department of Agriculture and/or the Owner's representative.

PART 3 – EXECUTION

3.1 INSPECTION

A. Verify topsoil placement and fine grading operations are complete. Verify all other preceding work required is complete and accepted by the Owner's representative.

3.2 PREPARATION

A. Verify finish grades are to specified elevations.

B. Wet soil surface uniformly to a depth of 2"- 3" or until upper surface is reasonable wet and compacted, before installing sod.

C. Roll soil with 100 lb. Roller; make two (2) passes as necessary.

3.3 INSTALLATION

A. Locate all trees and palms (existing or newly planted) in areas to be sodded and paint a 36-inch diameter circle on the soil around the trunk of each species. Located all shrub and groundcover planting beds and paint a line along the outside limits of mulch (see planting details for additional information). Do not install sod within any painted areas.

B. Install sod species as indicated on planting plans and these specifications within 48-hours of harvesting from field.

C. Begin sodding berms at bottom of slopes and install parallel to contours.

D. Lay first row of sod in straight line with long dimension of pads parallel to slope contours; continue laying sod accordingly.

E. Butt side and end joints flush and tight. Do not allow ends to curl or break.

F. Stagger end joints in adjacent rows. Do not stretch or overlap sod.

G. Peg sod on slopes with a ratio of 3:1 or greater using a minimum of two stakes per square yard using 6" minimum nursery grade bamboo stakes.

H. Sod installed adjacent to planting beds should be a minimum distance of 18" from the fist row of shrubs.

I. Cut a 36-inch diameter clean, round, saucer around each tree or palm planted in sodded areas to provide for mulch. Install a clean edge around all planting beds to provide smooth, flowing lines. Corners and angles shall be rounded. Do not injure root ball or cut sprinkler or utility lines. Rake and remove sod pieces and trimmings immediately after operations are complete.

J. Water sod immediately after installing.

K. Roll sod, except on pegged areas, with roller weighting not more than 100-pounds per foot of roller wither; make two passes.

L. Water sod and soil to depth of 4 inches within four hours after rolling

3.4 LAWN ESTABLISHMENT

A. Watering:

1. Keep soil uniformly moist for the first two weeks after planting.

2. After two weeks, supplement rainfall to produce total of approximately 1-1/2" of water per week or until sod has fully acclimated.

3. Monitor all newly sodded areas to insure that the irrigation system or manual watering operations are providing sufficient water to sod until acceptance by the Owner's representative.

B. Mowing:

1. Sod shall not be mowed for a period of three (3) weeks after installation.

2. The initial mowing should remove approximately 2-inches of leaf nut no more than 40% of leaf shall be removed in any single mowing.

3. The Contractor shall maintain all newly sodded areas until final acceptance by the Owner's representative. Sod shall be mowed based on the following:

   a. St. Augustine: every 7 days mow to 3-inches.

C. Re-sod areas larger than 1-square foot not having uniform stand of grass.

D. Weed Eradication: Contractor shall be responsible to insurance that all newly sodded areas are maintained in a seed-free condition until acceptance by the Owner's representative. Apply herbicides only upon approval by the Owner's representative.

E. The Contractor's maintenance period shall begin immediately after sod is installed and extend until acceptance by the Owner's representative (see SECTION 32 93 00 Plants).

3.5 FERTILIZING

A. Apply specified fertilizer three (3) weeks after sod installation. Broadcast at rate of 1 ½ pounds of nitrogen per 1,000 square feet of sod. Water to saturate all fertilized areas immediately after installation.

3.6 CLEANING

A. Immediately clean spills from paved and finished surface areas.

B. Remove debris and excess materials from project site.

C. Dispose of protective barricades and warning signs at termination of sod establishment.

3.7 FINAL INSPECTION AND ACCEPTANCE

A. Request final inspection for acceptance when all specified work is completed.

B. Replace rejected sod areas as directed by the Owner's representative (see SECTION 32 93 00 Plants).

END OF SECTION