

**MANUAL OF  
STANDARDS AND SPECIFICATIONS  
FOR  
ROAD AND DRAINAGE CONSTRUCTION**

**CITY OF  
WINTER GARDEN, FLORIDA**

**JANUARY 1, 2008**

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**ARTICLE 1**

**SHORT TITLE**

This resolution shall be known as the City of Winter Garden Road and Drainage Construction Specifications.

## **ARTICLE 2**

### **JURISDICTION**

These regulations apply to all subdivision roads and drainage construction within the City of Winter Garden.

## **ARTICLE 3**

### **PURPOSE**

These regulations are adopted for the purpose of establishing the minimum standards of road and drainage construction and related and appurtenant construction in the City of Winter Garden. Any item not specifically addressed in these specifications shall be in accordance with the FDOT Standard Specifications. The City Engineer will review specific products to make a determination of compliance with these specifications.

## ARTICLE 4

### DEFINITIONS

Except where specific definitions are used within a specific article or section of this resolution for the purpose of such sections, the following terms, phrases, words and their derivation shall have the meaning given herein when not inconsistent with the context. Words used in the present tense include the future tense, words in the plural number include the singular number and words in the singular number include the plural number. The word "shall" is mandatory, and the word "may" is permissive.

**AASHTO** - American Association of State Highway and Transportation Officials. Any reference to AASHTO standards shall be taken to mean the most recently published revision unless otherwise specified.

**A.C.I.** - American Concrete Institute.

**ASTM** - American Society for Testing and Materials. Any reference to ASTM standards shall be taken to mean the most recently published revision unless otherwise specified.

**B.P.R.** - Department of Business and Professional Regulation.

**CONSULTING ENGINEER** - An engineer or engineering firm licensed by the Florida Department of Business and Professional Regulation other than direct employees of the City of Winter Garden, retained to provide professional engineering services for a project.

**CONTRACTOR** - The person, firm or corporation with whom the contract for work has been made by the owner, the developer or the City.

**CITY ENGINEER** - The City Engineer of the City of Winter Garden, Florida, acting directly or through an assistant or other representative authorized by him, acting only within the scope of the particular duties assigned to him or the authority given him.

**DEVELOPER** - The person, firm or corporation engaged in developing or improving real estate for use or occupancy.

**F.D.O.T.** - Florida Department of Transportation.

**F.D.O.T. STANDARD SPECIFICATIONS** - The Florida Department of Transportation, State of Florida, Standard Specification for Road and Bridge Construction, latest edition.

**GEOTECHNICAL ENGINEER** - A Registered Engineer by the Department of Business and Professional Regulation (BPR) who provides services related to terrain evaluation and site selection; subsurface exploration and sampling; determination of soil and rock properties; foundation engineering; settlement and seepage analysis; design of earth and earth retaining structures, as well as the design of subsurface drainage systems and the improvement of soil properties and foundation conditions; as well as testing and evaluation of construction materials.

**OWNER** - The person, firm, corporation or governmental unit holding right of possession of the real estate upon which construction is to take place.

**P.C.A.** - Portland Cement Association.



## ARTICLE 5

### **CLEARING AND GRUBBING**

#### **Section 5.01 - General**

This Section covers clearing, grubbing, and stripping of the construction sites. The CONTRACTOR shall clear and grub all of the area within the limits of construction as shown on the PLANS and approved by the CITY prior to the beginning any WORK. All site work shall conform to the applicable site clearing ordinance, landscaping and tree ordinances of the CITY.

#### **Section 5.02 - Clearing and Grubbing**

##### **5.02.01 - Clearing**

The surface of the ground for the area to be cleared and grubbed shall be completely cleared of all timber, brush, stumps, roots, grass, weeds, rubbish and all other objectionable obstructions resting on or protruding through the surface of the ground. However, trees and shrubs shall be preserved as specified in Section 30.4.4. Clearing operations shall be conducted so as to prevent damage to existing structures and installations and to those under construction, and so as to provide for the safety of employees and others.

##### **5.02.01 - Grubbing**

Grubbing shall consist of the complete removal of all stumps, roots larger than 1-1/2 inches in diameter, matted roots, brush, timber, logs and any other organic or metallic debris not suitable for foundation purposes, resting on, under or protruding through the surface of the ground to a depth of 18 inches below the subgrade. All depressions excavated below the original ground surface for or by the removal of such objects shall be refilled with suitable materials and compacted to a density conforming to the surrounding ground surface.

##### **5.02.03 - Stripping**

In areas so designated, top soil shall be stripped and stockpiled. Topsoil so stockpiled shall be protected until it is placed as specified. Any topsoil remaining after all WORK is in place shall be disposed of by the CONTRACTOR.

##### **5.02.04 - Disposal of Cleared and Grubbed Material**

The CONTRACTOR shall at his expense dispose of all material and debris from the clearing and grubbing operation in accordance with all applicable ordinances.

#### **Section 5.03 - Dust Control**

CONTRACTOR shall control dust resulting from clearing and grubbing operations to prevent nuisance to adjacent property owners and the general public. CONTRACTOR shall use dust control methods and materials approved by the CITY.

#### **Section 5.04 - Surface Removal**

Along the proposed pipe lines as indicated on the PLANS, the CONTRACTOR shall remove the surface materials only to such widths as will permit a trench to be excavated which will afford sufficient room for proper efficiency and proper construction. All applicable CITY and FDOT regulations shall be followed. Where sidewalks, driveways, pavements and curb and gutter are encountered, care shall be taken to protect against fracture or disturbance beyond reasonable working limits. All fractured, broken or disturbed surfaces shall be restored to their original condition prior to completion of the WORK.

#### **Section 5.05 - Restoration**

Restoration of all surfaces including road subbase, soil cement, limerock base, asphaltic concrete surface, portland cement concrete pavement and driveways, sidewalks and concrete curbs shall be in strict accordance with ROAD CONSTRUCTION SPECIFICATIONS. All grassing and mulching shall be done as specified in the ROAD CONSTRUCTION SPECIFICATIONS. Solid sodding shall be placed on all slopes greater than 4:1, within 10 feet of all proposed structures and where existing sod is removed or disturbed by the WORK. In addition, CONTRACTOR shall restore all storm drains, culverts, inlets and storm manholes to equal or better condition in accordance with the ROAD CONSTRUCTION SPECIFICATIONS.

## ARTICLE 6

### **EXCAVATION AND EMBANKMENTS**

#### **Section 6.01 - Scope of Work**

The work covered by this Section consists of excavation and embankments required for roadway, ditches, drainage facilities and other works.

Unless otherwise provided, this Section shall include all excavation, shaping, filling, sloping and finishing necessary for the construction, preparation and completion of all embankments, subgrades, shoulders, drainage facilities, slopes, gutters, intersections, approaches, private entrances and other works all in accordance with the required alignment, grade and cross sections shown on the plans or as directed by the City Engineer.

#### **Section 6.02 - Excavation**

While the excavation is being done and until the work is finally accepted, the Contractor shall take the necessary steps to protect the work to prevent loss of material from the construction area due to the action of wind or water. During construction, the area shall be maintained in such condition that it will not constitute a hazard and will be well drained at all times.

#### **Section 6.03 - Unsuitable Material**

Where highly organic compressible or otherwise unstable material within the limits of the construction area is, in the opinion of the Geotechnical Engineer, unsuitable in its original position, the Contractor shall excavate such material and backfill with suitable material in a manner as approved by the City Engineer.

#### **Section 6.04 - Disposal of Excess Material**

Excess material shall be disposed of in accordance with current City Regulations.

#### **Section 6.05 - Placing Embankments**

Embankments shall be constructed true to lines, grades and cross sections shown on the plans, within a 0.1 foot tolerance. Embankments shall be constructed of suitable materials placed in successive level layers not more than 12 inches in thickness, loose measure, for the full width of the embankment, for the full length of the embankment, and compacted to a minimum density of 98% of the maximum density value as determined by A.A.S.H.T.O. T-180. Embankment under roadways and up to six feet outside the edge of pavement or curb shall be compacted to 98% of the maximum density values as determined by A.A.S.H.T.O. T-180.

#### **Section 6.06 - Stormwater Ponds**

A minimum of one (1) foot freeboard will be required for all stormwater ponds for the design storm event.

## ARTICLE 7

### SUBBASE

#### **Section 7.01 - Description**

Subbase shall be defined as that portion of the roadbed immediately below the base course or pavement including below the curb and gutter, the limits of which will ordinarily include those portions of the roadbed shown in the plans. The limits of the subbase shall be considered to extend outward to twelve (12) inches beyond the base. On roadways, where curbs are utilized, the subbase shall extend to twelve (12) inches beyond the back of curb. Eighteen (18) inches of clean fill shall be installed under the subbase to the limits described above. The clean fill shall have no more than 5 percent by weight finer than the No. 200 mesh sieve. Compact to a minimum ninety-eight (98) percent of AASHTO T-180.

#### **Section 7.02 - Requirements**

##### **7.02.01 - Under Limerock**

Not Used.

##### **7.02.02 - Under Soil Cement**

Compact to a minimum of ninety-eight (98) percent of AASHTO T-180 for top twelve (12) inches.

##### **7.02.03 - Under Curbs**

Stabilize top six (6) inches to a Limerock Bearing Ratio (LBR) of forty (40) and compact to a minimum of ninety-eight (98) percent of AASHTO T-180 for top eighteen (18) inches.

#### **Section 7.03 - Stabilization**

The stabilizing material, if any is required, shall be high bearing value soil, sand-clay, limerock, shell or other material approved by the City Engineer and shall meet the physical requirements of FDOT Standard Specifications, Section 914-2.

#### **Section 7.04 - Construction**

The surface of the subbase shall conform to the lines and grades as defined on the construction plans to a tolerance of 1/2-inch. After the stabilizing and compacting operations have been completed, the subgrade shall be firm and substantially unyielding, to the extent that it will support construction equipment and will have the bearing value required by the plans.

#### **Section 7.05 - Testing**

Inspector shall be notified 48 hours in advance of any sampling/testing period.

Tests for the subbase, LBR, thickness and compaction shall be spaced at a maximum of three hundred (300) feet apart and shall be staggered to the left, to the right, and on the centerline of the roadway. The City Engineer may direct additional tests when, in his opinion, conditions warrant additional testing to assure compliance with specifications. All tests shall be the responsibility of the owner/developer, and performed by a Geotechnical Engineer. A minimum of three (3) tests will be required per street and/or cul-de-sac.

## ARTICLE 8

### SOIL CEMENT STANDARDS

#### **Section 8.01 - Description**

Soil Cement shall consist of soil and Portland Cement uniformly mixed, moistened, compacted, finished and cured in accordance with these specifications, and shall conform to the lines, grades, thicknesses and typical cross-section shown on the plans.

#### **Section 8.02 - Mix Design**

A modified PCA Short Cut Procedure for sandy soil test method may be used in lieu of the wet-dry/freeze-thaw test method. A minimum seven (7) day laboratory compressive strength of three-hundred (300) psi shall be used to determine the cement content. A minimum of three (3) test pills will be required.

Processing of the base shall not be started until the soil-cement design mix, which has been prepared by a Geotechnical Engineer for the particular soil, has been submitted to and approved by the City of Winter Garden.

#### **Section 8.03 - Materials**

##### **8.03.01 - Portland Cement**

Portland Cement shall be Type I or Type I-P and shall comply with the Standard Specifications for Portland Cement ASTM C-145. Cement which is partially set, lumpy or caked shall not be used. One cubic foot of Portland Cement shall be considered to weigh ninety-four (94 lbs.) pounds minimum of 4.5% required.

##### **8.03.02 - Water**

Water shall be clean and free from substances deleterious to the hardening of the soil cement. pH shall be  $7 \pm 1$ .

##### **8.03.03 - Soil**

All sources of soil cement material shall be approved by the City Engineer prior to use.

Soil shall consist of sand, clay, shell, limerock or other materials as approved by the City Engineer. Other proprietary materials and mixes shall be tested using the soil cement standards.

#### **Section 8.04 - Equipment**

Soil cement shall be plant mix only and may be constructed with any machine, combination of machines or equipment that will produce the results meeting the requirements for soil pulverization, cement application, mixing, uniform depth control, water application, incorporation of materials, compaction, finishing and curing, as required by these specifications.

## **Section 8.05 - Construction Methods**

### **8.05.01 - Responsibility**

The Contractor is responsible for completing the project in accordance with plans and specifications and with experienced competent supervision.

### **8.05.02 - Preparation**

Before construction operations are begun, the area to be paved shall be graded and shaped as required to construct the soil cement base in conformance with the grades, lines, thicknesses and typical cross section shown on the plans. Additional soil needed, if any, shall be placed as directed. Unsuitable soil or material shall be removed and replaced with acceptable soil.

### **8.05.03 - Pulverization**

The soil shall be so pulverized that, at the completion of moist-mixing, one-hundred (100) percent by dry weight passes a one (1) inch sieve, and a minimum of eighty (80) percent passes a number four (4) sieve, exclusive of gravel or stone retained on these sieves.

## **8.06 - Mix-in-Place Application and Mixing Specifications**

(NOT USED)

## **Section 8.07 - Batch, Mix Design, Field Construction and Testing Specifications**

The supplier shall submit a mix design, prepared by an independent Geotechnical Engineer, to the City Engineer for approval prior to use of the material for road construction. Also, the supplier shall continuously monitor at the plant the batching and mixing of the material and submit to the City Engineer, as requested, reports, prepared by a Geotechnical Engineer of the graduation, cement content and moisture content. The Geotechnical Engineer shall monitor the installation and conduct applicable tests and inspections as outlined in Section 8.08.

The base material will be hauled to the project site from the batch plant and immediately placed on top of the prepared subgrade. The material shall be graded to conform to the lines and grades of the finished pavement section as shown on the project drawings and shall be placed in a sufficient thickness to assure the minimum required compacted thickness.

Construction of the soil cement base shall not proceed without twenty-four (24) hour notice to City and the Geotechnical Engineer with the Geotechnical Engineer being present during construction. The following is the minimum information/test data required to be obtained during construction:

- a. Area and date of construction
- b. Uniformity of mix
- c. Moisture content at time of compaction
- d. Percent compaction
- e. Compacted Thickness
- f. Field molded compressive strength pills

The Geotechnical Engineer shall monitor the installation and conduct applicable tests and inspections as specified in this section.

The material shall be placed in a single, uniformly thick layer. Not more than four (4) hours shall elapse from the time of batching to final compaction and the material shall not remain undisturbed for more than two (2) hours. The surface of the base materials may require the addition of water during the final rolling and shaping operation to prevent excessive surface moisture losses prior to sealing the base.

#### **Section 8.08 - Application of Water and Moist Mixing**

Immediately after and/or during the mixing of soil and cement, or the placement of batch mix, and before beginning the compaction the moisture content of the soil cement mixture shall be determined by the laboratory and, if required, water shall be applied uniformly in quantities required to obtain proper moisture content.

When water application and mixing has been completed, the percentage of moisture in the mixture and in unpulverized soil lumps, based on oven-dry weights, shall not be more than two (2) percentage points above the specified optimum moisture content, and shall be less than that quantity which will cause the soil cement mixture to become unstable during compaction and finishing.

#### **Section 8.09 - Compaction**

Prior to beginning of compaction, the mixture shall be in a loose condition for its full depth. The loose mixture shall then be uniformly compacted until the entire depth of the mixture is compacted to at least ninety-eight (98) percent of the maximum density prescribed in AASHTO T-134 as determined in the field on representative samples of soil cement mixture obtained from the roadway at the time compaction begins. During the compaction operations, shaping may be required to obtain the required grades and cross-section.

#### **Section 8.10 - Finishing**

After the mixture has been initially compacted, the surface of the soil cement shall be shaped to the required lines, grades and cross-section. During the shaping operations, the surface shall be lightly scarified to loosen any imprints left by the compacting or shaping equipment, when deemed necessary. The resulting surface shall then be compacted to the specified density with a pneumatic tire roller. Rolling shall be supplemented by broom-dragging, if required. The moisture content of the surface material must be maintained at not less than its specified optimum moisture content during finishing operations. Surface compaction and finishing shall be done in such a manner as to produce a smooth, dense-surface, free of surface compaction planes, cracks, ridges or loose material.

Surface finishing methods may be varied, provided a smooth, dense surface, free of surface compaction planes is produced. The moisture and density requirements shall be determined by the methods prescribed in AASHTO T-134.

#### **Section 8.11- Surface Testing**

After compaction and finishing have been completed, and not later than the beginning of the next calendar day after the construction of any section of the base, the surface shall be tested



with a template cut to the required crown and/or with a fifteen (15) foot straight-edge, laid parallel to the centerline, and all irregularities greater than 1/4-inch shall be immediately corrected with a blade adjusted to the lightest cut, which will ensure a surface that does not contain depressions greater than 1/4-inch under the template or the straight edge. The material removed shall be wasted. Additional wetting during and after this final shaping operation will be required to keep the base continuously moist.

#### **Section 8.12 - Prime/Curing**

After the soil cement has been finished as specified herein, it shall be protected by the application of bituminous coating. The curing material shall be applied as soon as possible after the completion of finishing operations. The finished soil cement shall be kept continuously wet until the curing material is placed.

#### **Section 8.13 - Construction Joints**

Prior to joining any previously constructed section of base, a vertical construction joint shall be formed by cutting back into the completed work to form a true vertical face of acceptable soil-cement to the full depth of the base course. The vertical face, if directed, shall be moistened prior to placing new material against it.

#### **Section 8.14 - Thickness Testing Tolerances**

During various stages of construction, test holes or cores shall be made in the mixture to determine the thickness. After the base is completed, test holes or cores shall be made or drilled at intervals of not more than three hundred (300) feet, or at closer intervals, if necessary, and the thickness of the base shall be determined from measurements made in these test holes.

An area of base found to be deficient in thickness by more than one (1) inch will be evaluated by the City Engineer; and if he determines that the service life of the base will be significantly reduced, it shall be removed and replaced with acceptable base of the thickness shown in the plans, at the Contractor's expense.

This deficiency may be made up in asphaltic concrete provided the grade control can be met.

#### **Section 8.15 - Opening to Traffic**

The Contractor will not be permitted to drive heavy equipment over the completed sections, but light weight pneumatic-tires equipment may be permitted after the surface has hardened sufficiently to prevent the equipment marring the surface and provided the protection and curing specified are not impaired. Completed sections may be opened to light traffic after twenty-four (24) hour protection, provided the surface has hardened sufficiently to prevent marring by traffic.

#### **Section 8.16 - Maintenance**

The Contractor shall maintain the base to a true and satisfactory surface until the wearing surface is constructed. Should any repairs or patching be necessary, they shall extend to the full depth of the base and shall be made in a manner that will assure restoration of a uniform base course conforming to the requirements of these specifications. The bituminous curing coating shall be maintained until the wearing surface is constructed.

**Section 8.17 - Final Inspection**

Prior to applying the asphalt wearing surface, an inspection of the base shall be performed by the City Engineer, Geotechnical Engineer and Contractor. All deficiencies shall be corrected and approved by the City Engineer prior to commencing paving operations.

If a Strength Test Value is less than sixty (60) percent of the Laboratory Design Strength, the material represented by the Strength Test Value shall be removed and replaced at no expense to the City.

**ARTICLE 9**  
**LIMEROCK BASE**

(NOT USED)

## ARTICLE 10

### **ASPHALTIC CONCRETE SURFACE COURSE**

#### **Section 10.01 - Scope of Work**

The work consists of the application of asphaltic concrete surface course composed of a mixture of aggregates and, if necessary, mineral filler and asphalt cement to produce the desired stability hereinafter described, properly laid upon a prepared base in accordance with these specifications and in conformity with the lines, grades, thickness and typical cross section shown on the plans. This work shall include the conditioning of the existing surface or base.

#### **Section 10.02 - Asphaltic Concrete Mixes**

Asphaltic concrete mixes shall conform with the requirements as specified in the Florida Department of Transportation (FDOT) Standard Specifications, 1996 Edition.

#### **Section 10.03 - Thickness of Pavement**

All thickness mentioned in the specifications and/or shown on the project drawing shall be an average thickness computed as follows:

The minimum thickness allowed shall be 1/4-inch less than the required average thickness. Thickness in excess of 1/4-inch of the required average thickness shall be computed at the design thickness plus 1/4-inch in computing the average thickness.

The thickness of the pavement shall be determined from the length of cores, at least two (2) inches in diameter, taken at random points on the cross-section and along the roadway, as determined by the City. Each core shall represent a section not longer than three hundred (300) feet. The average thickness shall be determined from the measured thicknesses. A signed and sealed report shall be provided reflecting the results.

If the Contractor believes that the number of cores taken is insufficient to properly indicate the thickness of the pavement, he may request additional cores at location designated by the City Engineer. All additional costs shall be borne by the Contractor.

When the deficiency in thickness is in excess 1/4-inch, the Contractor shall correct the deficiency either by replacing the full thickness for a length extending at least fifty (50) feet from each end of the deficient area, or (when permitted by the City Engineer) by overlaying. Normally, an overlay will not be permitted in a concrete curb section.

#### **Section 10.04 - Mechanical Spreading and Screeding Equipment**

Bituminous pavers shall be self-contained, self-propelled and can be steered. It shall be equipped with a receiving and disbursing hopper capable of holding a minimum quantity of five (5) cubic yards of bituminous paint mix material, to permit a uniform spreading operation. The hopper shall be equipped with a conveyor distribution system to place the mixture uniformly in front of the screed.

The paver shall also be equipped with a heated mechanical screed or strike-off assembly. The screed or strike-off shall be capable of adjustment to regulate the depth of material spread and produce a finished surface of the required evenness and texture, without tearing, shoving or gouging the mixture. Power boxes will not be acceptable as bituminous pavers in City rights-to-way (or subdivision roadways).

### **Section 10.05 - Construction Methods**

The mixture shall be spread on the surface designated only when the surface previously prepared is intact, firm, properly cured and dried; and only when the air temperature in the shade and away from artificial heat is above forty (40) degrees Fahrenheit and rising.

The mixture shall be delivered on the road in ample time to permit the spreading, rolling and surface testing during working hours. The temperature of the mixture at the time of spreading shall not exceed three hundred thirty-five (335) degrees Fahrenheit at the plant,  $\pm 25^{\circ}\text{F}$  from mix design temperature. Average of five (5) loads not-to-exceed  $15^{\circ}\text{F}$ .

Material shall be delivered to the job site with sufficient frequency that the paving operation can continue without interruption.

Depressions which may develop after the initial rolling shall be remedied by removing the mixture laid and adding new material to bring such depressions to a true surface. Such portions of the completed course that are defective in surface planeness, compaction or composition, or that do not comply with the requirements of these specifications, shall be removed and replaced with suitable mixture properly laid in accordance with these specifications.

Vertical joints shall be constructed prior to the commencement of the ongoing paving operation. All joints will be prepared according to the Department of Transportation Specifications.

### **Section 10.06 - Finished Surface Requirements**

For the purpose of testing the finished surface, the Contractor shall provide a fifteen (15) foot rolling straight edge and standard template cut to the true cross section of the road. These shall be available at all times during construction so that the City may check the finished surface. The Contractor shall provide and designate an employee whose duty it is to use the straight edge and template in checking all rolled surface under the direction of the City. Vertical measurement from a string line between curbs or calibrated "Smart Level" - using log sheet to determined crown may be accepted as an alternate. The finished surface shall be such that it will not vary more than 3/16-inch from the fifteen (15) foot rolling straight edge applied parallel to the centerline of the pavement and shall be of uniform texture and compaction. The surface shall have no pulled, torn or loosened portions and shall be free from segregation, sand spots or ripples. Irregularities of the surface exceeding the above requirements shall be corrected by the Contractor who has the option of selecting one of the following methods:

- a. Removing and Replacing - If correction is made by removing and replacing the pavement, the removal must be for the full depth of the course and extend at least fifty (50) feet on either side of the defective area, for the full width of the paving lane.
- b. Overlaying - If correction is made by overlaying, the overlay shall cover the length of the defective area and taper uniformly to a featheredge thickness at a

minimum distance of fifty (50) feet on either side of the defective area. The overlay shall extend full width of the roadway. Care shall be taken to maintain the specified cross slope. The mix used for the overlay may be adjusted as necessary for this purpose by the City Engineer. Overlaying will not be permitted when the finished pavement surface is a friction course or abuts concrete curbs.

- c. Other Methods - Correction of minor straightedge deficiencies by methods other than specified above may be approved by the City Engineer.

### **Section 10.07 - Tests**

All job mix design formulas shall have been approved by FDOT within the last twelve (12) months and submitted to the City of Winter Garden.

During construction of the asphaltic concrete pavement, the following tests must be completed and reports submitted to the City Engineer before acceptance can be given:

- a. Extraction Stability and Gradation of Combined Aggregate - one (1) test per 500 tons or part with a minimum of one (1) per day. Bitumen content, stability and gradation of aggregates to conform to intent of job mix formula. (Tests to be taken and run by Certified Asphalt Plant Technician.)
- b. Nuclear Method or Electronic Density Method Density and Depth Checks - one (1) test per three hundred (300) lineal feet of roadway (minimum two (2) tests per street). Minimum acceptable density for each course of asphaltic concrete material shall be ninety-five (95) percent of the design unit weight in the job mix formula. (Tests to be taken by Level 1 paving or greater.)

All tests and job mix formulas shall be made by a geotechnical engineer as approved by the City Engineer and all reports shall be signed and sealed by a registered professional engineer for the State of Florida. (When there is deficiency in test results for stability, gradation or field density, the City Engineer may require an extended warranty for acceptance.)

The following items may be required by the City Engineer:

- a. Plant inspection and calibration check - submit
- b. Aggregate verification - submit gradations
- c. Temperature control and verification - submit worksheets from plant
- d. Test of asphalt cement content - submit extractions
- e. Full-time construction monitoring
- f. Testing Log Showing: Tonnage, date, mix type, technician performing tests

## ARTICLE 11

### **PORTLAND CEMENT CONCRETE PAVEMENT**

#### **Section 11.01 - Scope of Work**

Rigid pavement consists of constructing a specified Portland Cement Concrete paving on a prepared subgrade. The utilities and other items in and beneath the street must be properly coordinated with the construction of rigid pavement to avoid all conflicts. The work to be done shall include the furnishing of all supervision, labor, materials, equipment and incidentals necessary for the proposed rigid pavement construction in accordance with the approved drawings and specifications.

#### **Section 11.02 - Subgrade Preparation for Rigid Pavements**

##### **11.02.01 - General**

The bottom of the excavation for the pavement or top of the earth will be known as the pavement subgrade and shall conform to the lines, grade and cross-sections shown on the plans.

Prior to placing the concrete, the subgrade shall be tested for conformity with the cross-section shown on the plans. If necessary, material shall be removed or added as required to bring all portions of the subgrade to the correct elevation. Concrete shall not be placed on any portion of the subgrade which has not been tested for correct elevation. The subgrade shall be cleared of all loose material. At any time that trucks, construction equipment or slip forming machines cause rutting or displacement of the subgrade materials, the subgrade shall be reshaped and compacted. The subgrade shall be in a moist condition at the time the concrete is placed.

##### **11.02.02 - Subgrade Material**

The top twelve (12) inches shall be composed of well drained granular soils that are predominately sandy, mixed with no more silt or clay than required to obtain a LBR 40 and be compacted to ninety-eight (98) percent of maximum density in accordance with AASTHO T-180.

##### **11.02.03 - Testing of Subgrade**

Tests for subgrade stabilization shall be located no more three hundred (300) feet than apart and shall be staggered to the left, right and on the centerline of the roadway.

Test reports subgrade stabilization shall be submitted to the City Engineer by the Engineer of Record for review and approval prior to paving.

When, in the judgment of the City Engineer, conditions warrant additional testing, the Engineer of Record will be advised that additional tests will be required and the extent of such additional tests.

### **Section 11.03 - Materials, Proportioning and Construction for Rigid Pavements**

The materials and proportioning shall be in accordance with ACI Standard 318, latest edition. All construction procedures shall be in accordance with FDOT Standard Specifications.

#### **11.03.01 - Strength Required**

All concrete shall have a minimum compressive strength of 3,000 psi at twenty-eight (28) days. Conformance to strength requirements shall be determined by ACI Standard 318, latest edition, Sections 4.8.2.3. and 4.8.3.

#### **11.03.02 - Slump**

The mixture shall contain no more water than is necessary to produce concrete which is workable and plastic. The minimum slump necessary to place the concrete satisfactorily shall be used. Slumps should be maintained so as not to exceed 4-1/2 inches for non-vibrated placement and not to exceed five (5) inches for vibrated placement.

The design mix shall be submitted to the City Engineer for approval prior to paving.

### **Section 11.04 - Equipment**

#### **11.04.01 - Forms**

The pavement shall be placed to lines and grades established by the Engineer. The edges of pavement shall be vertical to the subgrade and forms will be sufficient to support mechanical equipment.

#### **11.04.02 - Ready Mixed Plants**

The plant shall be in accordance with the FDOT Standard Specifications.

All plants must be FDOT certified or approved by the City Engineer.

#### **11.04.03 - On-Site Central Mix Plants**

The plant shall be in accordance with the FDOT Standard Specifications. The trucks used to transport the concrete shall be so constructed to prohibit segregation of the mix. All plants must be FDOT certified or approved by the City Engineer.

#### **11.04.04 - Paver**

All equipment used in the placement of concrete pavements shall conform to Section 350-3 of the FDOT Standard Specifications.

### **Section 11.05 - Mixing and Placing for Rigid Pavements**

#### **11.05.01 - General**

Concrete pavement shall be constructed on the prepared subgrade in accordance with these Regulations and in conformity with the lines, grades, thickness and



typical cross-sections shown on the construction plans. Concrete pavement shall meet the following minimum thickness requirements:

<b><u>Type Development</u></b>	<b><u>Roadway Classification</u></b>	<b><u>Minimum Concrete Thickness</u></b>
Residential	Marginal Access	6"
	Local Street	6"
	Minor Collector Street	6"
	Major Collector	6"
Industrial and Commercial	Marginal Access	6"
	Minor Street	6"
	Collector Street	8"

#### **11.0.5.02 - Transporting Concrete**

Concrete may be transported any distance providing it is discharged on the grade with the slump within the required slump range and meets concrete time limit requirements. If additional water is required to maintain the specified slump of concrete transported in truck mixers, it may be added with the permission of the City Engineer. In this case, at minimum of twenty-five (25) additional revolutions of the mixer drum at designed mixing speed shall be required before discharging the concrete.

#### **11.05.03 - Concrete Time Limit**

The length of time that the concrete can be held in the truck shall conform to the following:

- a. Air temperature forty-five (45) degrees Fahrenheit to eight (80) degrees Fahrenheit - ninety (90) minutes.
- b. Air temperature over eighty (80) degrees Fahrenheit with a retarder added to the mix - ninety (90) minutes maximum.
- c. Air temperature over eighty (80) degrees Fahrenheit without a retarder added to the mix - sixty (60) minutes maximum.
- d. The maximum temperature of the concrete at the time of placing shall be ninety-five (95) degrees Fahrenheit.

#### **11.05.04 - Placing Concrete**

The concrete shall be deposited on the grade in such a manner as to require as little rehandling as possible. It shall be deposited in successive batches in a continuous operation. The concrete shall be consolidated by suitable means so as to preclude the formation of voids or honeycomb pockets.

#### **11.05.05 - Placing in Cold Weather**

Concrete shall only be placed when the temperature is at least-forty (40) degrees Fahrenheit and rising. Any concrete damaged by frost action shall be removed and replaced.

### **Section 11.06 - Finishing**

#### **11.06.01 - General**

The concrete shall be struck-off, consolidated and finished with mechanical equipment in such a manner that after final finishing, it shall conform to the pavement cross-section shown on the construction plans. Hand finishing will be permitted in narrow widths, areas or irregular dimensions, and in the event of breakdown of the mechanical equipment only to finish the concrete already deposited on the grade.

#### **11.06.02 - Final Surface Finish**

The final surface of the pavement shall have uniform, skid-resistant texture. The method of texturing shall be approved by the City Engineer and may require changes in the final finishing procedure as required to produce the desired final surface texture. A burlap drag or transverse broom finish is recommended for local and collector streets. Arterial and rural roads may require an overlapping stiff bristled broom or steel comb finish at the City Engineer's option.

#### **11.06.03 - Pavement Exposed to Rain During Construction**

The Contractor shall always have materials available to protect the surface of the plastic concrete against rain. Areas of the pavement surface that exhibit a smooth sandy appearance after the rain ceases shall be textured before applying the membrane curing material. Areas that have suffered some surface erosion and have coarse aggregate exposed, shall be reworked by hand methods or with the finishing machine when the form paving method is used. Fresh concrete containing the same materials and properties as the pavement concrete shall be added to maintain an adequate supply in front of the screeds or machine to assure replacement of the concrete eroded from the surface. The surface shall then be textured and cured as specified.

If pavement edges have been severely eroded and the concrete has not set, the edges shall be repaired by setting side forms and replacing eroded concrete. After the side forms are set, fresh concrete shall be placed and finished prior to texturing and curing. After the pavement has hardened, remedial work shall not be permitted until after the curing period has terminated.

### **Section 11.07 - Curing For Rigid Pavements**

#### **11.07.01 - General**

After finishing operations have been completed and immediately after the free water has left the surface, the surface of the slab and, for slipformed pavements, the sides of the slab shall be coated and sealed with a uniform layer of membrane curing compound applied at the rate of not less than one (1) gallon per two hundred (200) square feet of surface. When the forms are removed, curing compound shall be applied to the sides of the slab. Areas in

which the curing membrane is damaged within a period of three (3) days shall be resprayed with curing compound.

Curing compound may be omitted when, in conjunction with protection of pavement from inclement weather, a polyethylene film or other acceptable material is applied over the pavement and maintained intact for three (3) days.

#### **11.07.02 - Cracks**

Concrete rigid pavement will not be accepted with excessive uncontrolled cracks. Shrinkage cracks must be avoided.

Uncontrolled cracks 1/8-inch or larger in width shall be repaired. One (1) of the following repair methods shall be used:

- a. Removal and replacement.
- b. Widen with power router and fill with an approved joint sealant.
- c. Epoxy grout injection.

The City Engineer shall determine which cracks are to be repaired and the method to be used.

### **Section 11.08 - Joints in Rigid Pavements**

#### **11.08.01 - General**

Transverse and longitudinal joints shall be constructed to a maximum spacing of fifteen (15) feet. Transverse joints shall extend the entire width of the pavement and through the curbs.

Joints must be sawed after the concrete has hardened and conform to the standard detail within this section.

Sawing of joints shall begin four (4) to six (6) hours after placing, or as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling and before uncontrolled cracking occurs. If necessary, the sawing shall be continuous regardless of weather conditions.

#### **11.08.02 - Construction Joints**

Longitudinal joints may be construction joints at the City Engineer's option. Transverse construction joints shall be installed whenever the placing of concrete is suspended a sufficient length of time for the concrete to begin to harden.

#### **11.08.03 - Joint Sealing**

Joints shall be sealed, if required, before the pavement is exposed to traffic, including construction traffic. Prior to sealing, all foreign material shall be removed from the joints and the joints shall be thoroughly dry.

## **Section 11.09 - Final Acceptance for Rigid Pavements**

### **11.09.01 - General Acceptance for Rigid Pavements**

Before the pavement will be considered for acceptance, all items shall be complete in accordance with the construction plans and these Regulations. Equipment, surplus materials, and construction debris shall be removed from the project.

### **11.09.02 - Opening to Traffic**

The pavement shall be closed to traffic after the concrete is placed and until it reaches a compressive strength of 2,500 psi under ordinary field conditions. This does not include the sawing and sealing equipment or other light miscellaneous equipment.

### **11.09.03 - Testing of Concrete**

Concrete pavement shall have a twenty-eight (28) day compressive strength of 3,000 psi Portland Cement Concrete control for slump testing, and concrete cylinder samples and testing is required and shall be in accordance with AASHTO and ASTM Specifications, latest editions. Test reports shall be submitted to the City Engineer by the Engineer of Record for review.

Final acceptance shall be based on testing in accordance with other paving requirements.

## ARTICLE 12

### CULVERTS AND STORM SEWERS

#### **Section 12.01 - Scope of Work**

The work in this Section shall consist of furnishing culverts and storm sewers with appurtenances in conformance with the specifications here after described and of the sizes and dimensions shown on the plans. The minimum pipe size allowed under the pavement shall be 18 inches in diameter.

#### **Section 12.02 - Pipe**

##### **12.02.01 - Concrete Pipe**

Concrete pipe shall be of first quality, conforming to the latest revision of ASTM C-76 for round pipe and ASTM C-507 for elliptical pipe. The size and class shall be as shown on the plans. Lifting holes are prohibited. Joints for all round pipe shall be sealed by the use of round rubber gaskets and shall conform to the applicable provisions of ASTM C-443. Joints for elliptical pipe may be a tongue and groove type and sealed with a preformed gasket material. The preformed gasket shall be applied to form a continuous gasket around the leading edges of both the primed tongue and groove in a manner that when the pipes are joined, the entire annular space will be filled with gasket material and there will be evidence of squeeze out of gasket material for the entire internal and external circumference of the joint.

The jointing system shall prevent soil infiltrating into the pipes. All joints shall be water tight. Joints for all round pipe within the limits of the City of Winter Garden shall be wrapped with filter fabric. Joints for all elliptical pipe, regardless of location, shall be wrapped with filter fabric.

The fabric shall extend a minimum of three (3) feet on both sides of the joint and shall have a two (2) foot overlap on the top of the joint. Banding of the filter fabric may be required at the discretion of the City Engineer.

##### **12.02.02 - Corrugated Metal Pipe**

(NOT USED)

##### **12.02.03 - Polyvinyl Chloride Pipe**

All polyvinyl chloride (PVC) pipe and fittings shall conform to current AASHTO Standard Specification M-304. The pipe and the fittings shall be made of PVC having a minimum cell classification of 12454C or 12364C as specified in ASTM D1784. Pipe ends shall not be permanently exposed to direct sunlight, and shall be protected by a metal or concrete end treatment.

Joints shall be of an integral bell gasketed design, and shall be gasketed with a rubber or neoprene gasket. The jointing system shall prevent soil and water infiltrating into the pipe. All joints within the limits of the City of Winter Garden Right-of-Way shall be watertight in

accordance with ASTM D-3212 and shall be wrapped with filter fabric. The fabric shall extend a minimum of three (3) feet on both sides of the joint and shall have a two (2) foot overlap on the top of the joint. Banding of the filter fabric may be required at the discretion of the City Engineer.

### **Corrugated Polyvinyl Chloride Pipe**

PVC corrugated pipe with a smooth interior shall conform to the requirements of ASTM designation F949. Pipe and fittings shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. Pipe shall be manufactured to 46 psi stiffness when tested in accordance with ASTM test method D2412. There shall be no evidence of splitting, cracking or breaking when the pipe is tested per ASTM test method D2412 in accordance with ASTM F949 section 7.5 and ASTM F794 section 8.5. The pipe shall be made of PVC compound having a minimum cell classification of 12454 as defined in ASTM specification D1784

All fittings for PVC corrugated sewer pipe with a smooth interior shall conform to ASTM F949, section 5.2.3 or F 794, section 7.2.4. To insure compatibility, the pipe manufacturer shall provide all fittings.

All joints shall be made with integrally-formed bell and spigot gasketed connections. The manufacturer shall provide documentation showing no leakage when gasketed pipe joints are tested in accordance with ASTM test method D3212. Elastomeric seals (gaskets) shall meet the requirements of ASTM designation F477.

Installation shall be in accordance with ASTM D2321 and the pipe manufacturer's recommended installation guidelines. ASTM D2321 is a widely accepted method for installation of thermoplastic pipe. It is critical the Engineer require that all sections of the specification be adhered to and realize the Engineer is ultimately responsible for all aspects of the soil/pipe system performance. Class I backfill shall be used for all PVC stormsewer installed within the City of Winter Garden. Water stop gaskets shall be installed at all structures per the manufacturer's guidelines. Only non-shrink grout shall be used when connecting to drainage structures.

### **12.02.04 - Ductile Iron Pipe**

All Ductile Iron pipes shall conform to the current requirements of ANSI/AWWA Standard A21.51/C151 and the joints shall meet ANSI Standard A21.11.

### **12.02.05 – High Density Polyethylene Pipe (ADS N-12 HP)**

Polypropylene compound for pipe and fitting production shall be impact modified copolymer meeting the material requirements of ASTM F2736, Section 4, ASTM F2881, Section 5 and AASHTO MP-21-11, Section 6.1, for the respective diameters.

Pipe requirements are as follows: 12 inch through 30 inch pipe shall have a smooth interior and annular exterior corrugations and meet or exceed ASTM F2736 and AASHTO MP-21-11. 36 inch and 48 inch pipe shall have a smooth interior and annular exterior corrugations and meet or exceed ASTM F2881 and AASHTO MP-21-11.

Pipe shall be joined with a gasketed integral bell and spigot joint meeting the requirements of ASTM F2736 and F 2881, for the respective diameters. 12 inch through 48 inch shall be watertight according to the requirements of ASTM D3212. 12 inch through 48 inch shall have a reinforced bell with a polymer composite band installed by the manufacturer. Spigots shall have gaskets meeting the requirements of ASTM F477. Gasket shall be installed by the pipe manufacturer and covered with a removable protective wrap. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.

To assure watertightness, field performance verification may be accomplished by testing in accordance with ASTM F2487. Contact the manufacturer for recommended leakage rates.

Installation shall be in accordance with ASTM D2321 and the pipe manufacture’s recommended installation guidelines. ASTM D2321 is a widely accepted method for installation of thermoplastic pipe. It is critical the Engineer require that all sections of the specification be adhered to and to realize the Engineer is ultimately responsible for all aspects of the soil/pipe system performance. Class I backfill shall be used for all high density polyethylene pipe installed within the City of Winter Garden. Water stop gaskets shall be installed at all structures per the manufactures guidelines. Only non-shrink grout shall be used when connecting to drainage structures. No pipe joints shall be permitted under the roadway within residential subdivisions. All road crossings within residential subdivisions shall be constructed such that a continuous length of pipe spans the distance between drainage structures.

Any contractor installing HDPE pipe within the City of Winter Garden shall be certified by the pipe manufacturer as qualified to install said piping material. A copy of the certification must be presented to the city prior to the issuance of the site permit.

**12.02.06 – Alternate Pipe Material**

Alternate pipe materials will be considered on a case by case basis. Final approval of pipe material and backfill will be determined by the City Engineer.

**Section 12.03 - Laying Pipe**

All pipe shall be carefully laid, true to the lines and grades as shown on the plans. All pipe shall be laid “in the dry”. Pipe shall be laid in compliance with the manufacturers recommended installation guidelines.

**12.03.01- Concrete Pipe**

The joint shall be thoroughly lubricated and assembled according to the manufacturer's recommendations so that the maximum width of the joint opening shall not exceed that shown below:

<u>Pipe Diameter</u>	<u>Maximum Joint Opening</u>
12	5/8”
15	5/8”
18	5/8”
24	7/8”

30	7/8"
36	7/8"
42	7/8"
48	7/8"
54	7/8"
60	7/8"
66	7/8"
72	1"

If, while making the joint, the gasket comes loose and can be seen through the exterior joint recess when the joint is pulled up within one (1) inch of closure, the dry pipe shall be removed and the joint remade.

**12.03.02 - Corrugated Metal Pipe**

(NOT USED)

**12.03.03 - Polyvinyl Chloride Pipe**

Pipe interior shall be reasonably uniform and as nearly circular as possible. Structure shape shall be checked regularly during backfilling and upon completion of installation to verify acceptability of the construction method used. At the discretion of the City Engineer, deflection measurement or testing may be required. Pipes should not deflect more than five (5) percent in any direction. Testing equipment and test supervision will be provided by the Contractor. Testing will be done using a mandrel having a diameter equal to ninety-five (95) percent of the inside diameter of the pipe.

The test shall be performed without mechanical pulling devices or re-rounders. Measuring devices other than a mandrel may be used for measuring deflection in pipe forty-two (42) inches or larger, as approved by the City Engineer.

**12.03.04 - Pipe Inlet/Manhole Joints**

The joints of pipe and inlet/manhole shall be carefully cleaned and completely filled with non-shrink mortar applied and cured in accordance with the manufacturer's recommendations. An asphaltic mastic material shall be applied twelve (12) inches in width from the joint around the exterior of the pipe(s) and on the exterior wall(s) of the inlet/manhole. A continuous twenty-four (24) inch width of filter fabric shall be wrapped around each joint and shall have a two (2) foot overlap on the top of the pipe inlet manhole joint. All pipes shall be carefully laid, true to the lines and grades as shown on the plans. All pipes shall be laid "in the dry".

PVC and HDPE pipe shall be installed with water stop gaskets.

**12.03.05 - Right-of-Way and Easements**

Trees shall not be planted within any rights-of-way, utility easements, or drainage easements that are dedicated to the City of Winter Garden.

**Section 12.04 - Backfilling**



Backfilling shall progress as rapidly as the construction and testing of the work will permit. All backfill material shall be suitable and free of deleterious material 5 percent passing - 200. The initial backfill shall be carefully deposited on both sides of the pipe at the same time and uniformly compacted around the barrel of the pipe until enough has been placed to provide a cover of one (1) foot above the crown of the pipe. In no case, shall backfill material be placed in the trench in a manner that will cause shock to, or unequal pressure on the pipe. The backfill shall be placed and compacted to a minimum of ninety-eight (98%) percent of maximum density as determined by AASHTO T-180 under and within six (6) feet of the traveled way and under other existing hard surfaced or previously compacted areas. In all areas except for those stated, compaction must be a minimum ninety-eight (98%) percent of maximum density as determined by AASHTO T-180, or as directed by the City Engineer. Under no condition is construction debris, concrete, etc., to be included with the backfill. (As per manufacturer's specifications.)

### **Section 12.05 - Pipe Foundations**

Where the nature of the foundation materials is of poor supporting value, the foundation material shall be replaced with sand or other material, or as approved by the City Engineer. The foundation material shall be consolidated by mechanical methods to specified densities.

### **Section 12.06 - Tests**

#### **12.06.01 - Compaction Tests**

Compaction tests shall be required for each three hundred (300) linear feet or three (3) per day of pipe as a minimum. The City Engineer may determine that more compaction tests are required to certify the installation depending on field conditions. The locations of compaction tests within the trench shall be in conformance with the following schedule:

- a. One (1) test at the springline of the pipe.
- b. One (1) test at an elevation one (1) foot above the pipe crown.
- c. One (1) test for each one (1) feet of backfill placed above one (1) foot above the pipe crown to subgrade elevation.
- d. All structures shall be tested every six (6) inches from the bottom of the structure to the top of the structures, alternating sides.
- e. Compaction test shall be performed as lifts go in. City Inspector shall be informed of testing as it's done. Done during regular business hours. No testing after hours or after three (3) lifts are placed.

#### **12.06.02 - Pipe Certification**

A pipe certification shall be submitted to the City Engineer for all pipe furnished or as approved by the City Engineer. The certification shall be signed and sealed by a registered professional engineer for the State of Florida. The certification shall state that the

pipe installed and materials supplied comply with all applicable specifications contained herein.

### **12.06.03 - Acceptance of Concrete Pipe Prior to Installation**

In addition to any deficiencies not covered by the applicable ASTM specifications, individual concrete pipe sections shall be subject to rejection due to any of the following:

1. Surface defects indicating honeycombed or open texture that would adversely affect the function of pipe sections. On-site repairs may be made, if approved by the City Engineer.
2. Damaged ends, where such damage would prevent making a satisfactory joint.
3. Pipe which has been excessively patched or repaired. Pipe damaged during shipment or construction may be repaired with the approval of the City Engineer.
4. Exposure of the reinforcement. The exposure of the ends of longitudinals, stirrups and spacers used to position reinforcement shall not be cause for rejection.
5. Concrete pipe that has been delivered to the jobsite prior to being at least seven (7) days (168 hours) old.

**Acceptance of the pipe at point of delivery will not relieve the Contractor of full responsibility for any defects in materials due to workmanship.**

### **12.06.04 - Process for Storm Pipe Inspection / Rejection**

Upon arrival of pipe to be used on a project the following criteria shall be used to assess the product.

1. The pipe shall be unloaded prior to inspection by project personnel.
2. Manufactured defects shall be inspected for including: broken bells and spigots, excessive honeycombing, exposed reinforcing steel, cracks of any type, tears, deformation in excess of 5 percent, and any other structural defects.
3. In the event that a defect is found, the following markings will be placed on the defective pipe:
  - a. For complete rejection of a piece of pipe an orange dot with an X through it will be placed on the center of the top, outside surface of the pipe. In addition, the same marking will be placed on the inside of the pipe. (Please note that if any pipe is found to have this marking during the TV inspection, this pipe shall be removed and replaced. There will be no exceptions. See Note 5.)
  - b. When a bell or spigot is damaged, and the Inspector deems it can

be used for: 1) a piece coming out or into a structure; 2) a repair can be made to the piece; a small orange dot will be placed near the defective area.

4. When rejected pipe is found, it shall be marked, separated, and removed from the project as soon as possible.
5. Any pipe found to be rejected with the orange dot covered by an X during TV inspection shall be removed and replaced at no expense to the City of Winter Garden. In the event that there is rejected product in the ground, there will be no exceptions given for any reason to leave this pipe in place.

#### **12.06.05 - Testing and Inspection for Acceptance of Storm Sewer Systems**

##### CLOSED CIRCUIT TELEVISION INSPECTION OF STORMWATER SYSTEMS

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. Section Includes: Requirements to execute internal closed circuit television (CCTV) survey to inspect storm sewer.

All culverts and storm sewer systems shall be inspected by an internal closed circuit television survey prior to initial acceptance by the City. This inspection shall include the use of laser profile technology for all thermoplastic pipe.

All culverts and storm sewer systems shall be inspected by an internal closed circuit television survey as part of the end of warranty inspection. The end of warranty video inspection shall be performed on all storm sewer systems whether they are public or private (gated community). This inspection shall utilize laser profile technology for all thermoplastic pipe. The cost of this survey shall be borne fully by the developer of the project. All repairs (if needed) shall be completed and re-inspected prior to the end of the warranty period.

##### 1.2 SUBMITTALS

- A. Submit following:
  1. Sample of television survey log, DVD/CD-ROMs, and equipment list for approval before commencement of work.

#### PART 2 - PRODUCTS

##### 2.1 MATERIALS

- A. General

1. Provide equipment to perform inspections of sewer mains located in streets, street rights-of-way, and off road easements.
    - a. Including but not limited to portable CCTV equipment, vehicles capable of transporting TV equipment and accessing remote easements, and adequate cleaning equipment.
    - b. Pipe plugs, pumps, equipment, and operators as needed to prepare and maintain sewer system conditions for test period.
  2. Certify that backup equipment is available and can be delivered to site within 48 hours.
- B. Software Requirements: PACP certification and video recording.
- C. CCTV
1. Color Video Camera
    - a. Specifically designed and constructed for this application.
    - b. Camera, 17-inch minimum, Closed Circuit, Color Television Monitor, and Other Components: Capable of producing a color video picture with a standard resolution of 720 x 480.
    - c. Produce 720 x 480 line resolution minimum.
    - d. Pan and tilt type, capable of turning at right angles to pipe's axis over an entire vertical circle (minimum pan of 270 degrees and rotation of 360 degrees).
    - e. Lighting: Suitable to allow clear picture of entire inner pipe wall extending at least 20 feet in front, including black High Density Polyethylene (HDPE) pipe.
    - f. Operative in 100 percent humidity conditions.
    - g. Image: Capable of self righting itself.
    - h. Include data view display feature capable of showing on tape following information.
      - 1) City and state.
      - 2) Date and time.
      - 3) Project name.
      - 4) Contractor's name.
      - 5) Inside pipe diameter and type.
      - 6) Manhole identification (upstream manhole to downstream manhole).
      - 7) On-going footage counter accurate within 0.2 foot, per 100 feet.

- 8) Include operator narration, in format approved by City Inspector, using Commission approved terminology.
- 9) Recording of single section of storm sewer onto 2 DVD/CD-ROMs will not be acceptable.
- 10) Clearly label each DVD/CD-ROM as approved by the City Inspector.

D. Recording Media

1. Provide a high quality DVD in a MPEG2 format video with a standard resolution of 720 x 480.
2. Camera, Television Monitor, and Other Components: Capable of producing a minimum 720 x 480 line resolution color video picture.

## PART 3 - EXECUTION

### 3.1 PRE-CONSTRUCTION SURVEY

A. Procedure

1. CCTV

a. Mainline

- 1) Before repair work, clean and inspect storm line from manhole to manhole, preferably upstream to downstream, one section at a time. Lines shall be completely cleaned prior to TV.
- 2) Maintain main isolation by plugging or bypass pumping while camera is moving and recording.
  - a) Plugs: Secured so as to remain in place during inspection.
  - b) Conduct operations to prevent building backups from rain events.
  - c) Be responsible for cleanup, repair, fines, property damage costs and claims for any storm backups.

2. Placement of camera

a. Manhole

- 1) Place at center of manhole and commence video recording before entering pipe.

- 2) Start footage counter at beginning of pipe run at edge of manhole.
- b. Mainline: Mount on a transport platform that will keep it centered along longitudinal axis of storm mainline and above water.
  - 1) Place camera into connection and commence video recording before entering connection.
  - 2) Start footage counter at connection.
3. Operation of Camera
  - a. Provide full 360 degree pan of all pipe joints. Camera shall be located precisely at each joint. Film the entire circumference at each joint.
  - b. Show inside of manhole walls, manhole channel, and pipe connection to wall at both upstream and downstream manhole.
  - c. Camera shall be centered and proceed at speed no greater than 30' / min.
  - d. Maintain technical quality, sharp focus, and distortion free picture.
  - e. Videotape a section of storm in its entirety with no breaks or interruptions.
  - f. Pan, tilt, and rotate as necessary to best view and evaluate defects, features, and points of interest.
  - g. Use power winches, powered rewinds, tractors, or other devices that do not obstruct camera view or interfere with proper documentation of storm line conditions to move camera through storm lines.
    - 1) Whenever non-remote powered and controlled winches are used provide suitable means of communication between manholes to insure good communications.
  - h. Use hydraulic jet nozzle if necessary to remove standing water from line.
    - 1) Utilize blower as needed to defog storm line.
  - j. Measurement for location of defects and service laterals
    - 1) At ground level by means of City Inspector-approved footage counter or metering device.

- 2) Measurement Meters: Accurate to 0.2 foot over length of section being televised.
- 3) Use measuring target in front of television as exact measurement reference point.

B. Field Documentation

1. Mainline

- a. Submit original records, logs, DVD's, CD-ROMs, and electronic data for sewer line inspection to City Inspector at end of day's inspection. Copies of the inspection will be provided by the City at Contractor's request.
- b. Include, but not be limited to following information:
  - 1) Project Number.
  - 2) Basin Name.
  - 3) Owner.
  - 4) Date, time (begin to end inspections).
  - 5) Weather condition.
  - 6) Operator name.
  - 7) QA reviewer name.
  - 8) DVD/CD number and index.
  - 9) Manhole number to manhole number.
  - 10) Manhole depths.
  - 11) Length of pipe segment.
  - 12) Direction of CCTV (Upstream or Downstream).
  - 13) Pipe size.
  - 14) Pipe material.
  - 15) General physical conditions.
  - 16) Footage locations, clock position, descriptions, and estimated leakage rates for visible point sources of infiltration/inflow.

- 17) Footage locations, clock position, and descriptions of defects such as obstructions, root intrusion, blockages in pipe, deteriorated joints, offset joints, holes, breaks, cracks, collapses, bends or sags in alignment.
  - 18) Footage locations, clock position, and descriptions of other defects, features and points of interest found.
  - 19) Whether CCTV was complete or incomplete.
  - 20) All thermoplastic pipe shall be inspected utilizing laser profile technology per FDOT's Standard Specifications for Road and Bridge Construction - latest edition.
- c. DVD/CD-ROM Recording/Playback
- 1) At same speed that it was recorded.
  - 2) Supply slow motion or stop motion playback features.
  - 3) Once recorded, DVD/CD-ROM becomes property of the Commission.
  - 4) Have DVD/CD-ROM and necessary playback equipment readily accessible for review by City Inspector during Project.
- d. Observation Terminology Utilized During Audio Narration: Follow the Commission approved terminology.
- e. DVD/CD-ROMs displaying poor video quality refers to, but is not limited to grease or debris on lens, camera under water, image too dark, washed-out, distorted, or out of focus, lines improperly cleaned, and poor/no audio.
- 1) Re-televiser line if necessary and resubmit DVD/CD-ROM.

### 3.2 POST-CONSTRUCTION SURVEY

- A. Procedure: Follow procedures as specified for pre-construction survey above and as specified below.
1. Stop camera (minimum 10 seconds) at beginning and end of repairs and inspect repaired section.
  2. Appropriate reinspection fees will be charged for inspection of repairs.



## ARTICLE 13

### INLETS AND MANHOLES

#### **Section 13.01 - Scope of Work**

The work specified in this Section shall consist of construction inlets and manholes. These structures shall be constructed of Portland Cement Concrete and reinforcing steel with the necessary metal frames and gratings. They shall be constructed in conformity with the detailed plans and in accordance with these specifications.

#### **Section 13.02 - Materials**

Concrete shall have a minimum compressive strength of 3,000 psi at twenty-eight (28) days. The mortar for masonry shall be of Portland Cement and sand, mixed in the proportions of one part cement to three parts sand. At the option of the Contractor, high early strength cement may be used.

#### **Section 13.03 - Forms**

Forms shall be built true to line and grade, braced in a substantial and unyielding manner and so designed and constructed that they may be removed without injury to the concrete.

#### **Section 13.04 - Placing and Curing Concrete**

The concrete shall be placed in the form to the depth shown on the plans and thoroughly tamped and spaded. After the concrete has hardened sufficiently, it shall be covered with suitable material and kept moist for a period of three (3) days or longer, if necessary, and shall be protected in a satisfactory manner from the elements until thoroughly cured.

#### **Section 13.05 - Masonry Construction**

Masonry construction shall be limited to completion of doghouses around pipes, adjusting manhole covers, etc., or as approved by the City Engineer. It is the intent of the specification that structures be constructed of precast concrete or cast-in-place concrete. All clay brick used shall conform to the current ASTM Designation C-55 Grade P-11. (Bricks shall be soaked prior to placement for a minimum of one (1) hour.)

#### **Section 13.06 - Precast Inlets and Manholes**

Precast manholes, inlets and junction boxes shall be in accordance with ASTM C-478 or the standard specifications.

#### **Section 13.07 - Placing Pipes**

The inlet and outlet pipes shall be flush with the inside face of the wall. The joints of pipe and inlet/manhole shall be carefully cleaned and completely filled with non-shrink mortar applied and cured in accordance with the manufacturer's recommendations. An asphaltic mastic material shall be applied twelve (12) inches in width from the joint around the exterior of the pipe(s) and on the exterior wall(s) of the inlet/manhole. A continuous twenty-four (24) inch width or filter

fabric shall be wrapped around each pipe inlet/manhole joint. The filter shall be thoroughly bonded to the asphaltic mastic material. A waterstop gasket shall be installed where HDPE pipe connects to structures.

## ARTICLE 14

### **SIDEWALKS, CONCRETE CURBS AND MISCELLANEOUS CONCRETE WORK**

#### **Section 14.01 - Scope of Work**

The work specified in this Section consists of the construction of curb, curb and gutter, valley gutter, or sidewalks of Portland Cement Concrete. Such work shall be constructed in accordance with these specifications and in conformity with the lines, grades, dimensions, and notes shown on the plans.

#### **Section 14.02 - Materials**

Unless otherwise shown on the plans, concrete shall be Class 1.

#### **Section 14.03 - Forms**

Forms for this work shall be made of either wood or metal. They shall be straight, free from warp or bends and of sufficient strength when staked to, resist the pressure of the concrete without springing.

Forms shall have a depth equal to the plan dimensions for the depth of the concrete being deposited against them.

#### **Section 14.04 - Construction Methods**

Excavation shall be made to the required depth and the subgrade or base upon which the curb, curb and gutter, valley gutter and sidewalks are to be set, shall be compacted as specified.

The concrete shall be placed in the forms to the depth specified and tamped and spaded until mortar entirely covers its surface. The top of the curb or gutter shall be floated smooth and the edges rounded to the radius shown on the plans.

#### **Section 14.05 - Joints**

Where metal templates are used for joint construction, the curb, curb and gutter, etc., shall be constructed in uniform sections ten (10) feet in length, except where shorter sections are necessary for closures, but no section shall be less than four (4) feet.

At the option of the Contractor, the sections may be formed by the use of dummy joints (either formed or sawed within 24-hours) or by the use of metal templates. If metal templates are used, they shall be of the dimensions and shall be set to the lines shown on the plans. The templates shall be held firmly during the placing of the concrete and shall be left in place until the concrete has set sufficiently to hold its shape, but shall be removed while the forms are still in place. Dummy joints shall be spaced at ten (10) foot intervals for curb and five (5) foot intervals for sidewalk. They shall be 1/4 the depth of the concrete. Expansion joints shall be placed in sidewalks at driveways, side walk intersections, all inlets, all radius points and all points where operations cease for any considerable time (such as the end of the day's run).

## **Section 14.06 - Finishing**

### **14.06.01 - Surface Requirements**

The gutter or flow-line section or curb shall be tested with a ten (10) foot straight edge laid parallel to the center-line of the roadway and while the concrete is still plastic. Irregularities in excess of 1/4-inch shall be immediately removed.

### **14.06.02 - Repair of Minor Defects**

The forms shall be removed within twenty-four (24) hours after the concrete has been placed and minor defects then filled with mortar composed of one part Portland Cement and two parts fine aggregate. Plastering will not be permitted on the face of the curb and any rejected curb, curb and gutter, or valley gutter shall be removed and replaced.

### **14.06.03 - Final Finish**

The top of the curb and the face from the top to eight (8) inches below shall be given a surface finish while the concrete is still green. In general, only a brush finish will be required.

## **Section 14.07 - Curing**

If curing compound is used, moistening is not required; otherwise, curbs shall be covered with suitable material and kept moist for a period of three (3) days, or longer, if necessary, and shall be protected in a satisfactory manner from damage by the elements or other causes until acceptance of the work.

## **Section 14.08 - Backfilling and Compaction**

After the concrete has set sufficiently, but not later than three (3) days after pouring, the spaces in front and back of the curb shall be refilled to the required elevation with suitable material, which shall be placed and thoroughly compacted in layers not thicker than six (6) inches.

Where bases are to be constructed adjacent to the curb, the concrete shall be properly backfilled and shall set for a period of not less than three (3) days before any base material is placed against it.

Sidewalk: Shall be at a 2 percent slope towards roadway. No more than .25 feet or (3 inches) difference in top of curb to front face of sidewalk is permitted.

Driveways: No more than 18 percent slope allowed in driveways.

## ARTICLE 15

### CHAIN LINK FENCE

#### **Section 15.01 - Scope of Work**

The work specified in this Section consists of furnishing and erecting chain link fence of the type and at the locations shown in the plans, in accordance with these specifications and in conformity with the lines, grades, notes and typical sections shown in the plans.

#### **Section 15.02 - Materials**

##### **15.02.01- General**

The fabric, posts, fastenings, fittings and other accessories for chain link fence shall meet the requirements of AASHTO M-181, with the following changes:

- a. The weight of coating of uncoated wire fabric shall be 1.2 ounces of zinc per square foot (Class B).
- b. The galvanizing of steel materials shall be hot dipped galvanized.
- c. The weight of coating of uncoated posts and braces shall be 1.8 ounces of zinc per square foot, both inside and outside to meet the requirements of AASHTO M-111.

##### **15.02.02 - Fabric**

The base metal of the fabric shall be a good commercial quality 11 1/2 gauge steel wire unless otherwise shown on the plans.

The fabric shall be of uniform quality and, unless otherwise specified, shall be sixty (60) inches high with a 2-1/4-inch mesh size.

##### **15.02.03 - Steel Posts, Brace, Gates and Accessories**

All steel line, corner, end and pull posts, braces, rails and gate frames shall be tubular and shall meet the requirements of Table A2 and AST 4 A-53, for Standard Weight Pipe (Schedule 40/SS 40) except that test pressure requirements may be waived. All posts and rails shall be in accordance with the following table:

- a. End, corner and pull posts - 2-3/8-inch O.D., Schedule 40/SS40.
- b. Line posts and gate frames - 2-inch O.D., Schedule 40/SS40.
- c. Gate Posts - 4-inch O.D., Schedule 40/SS40.
- d. Post braces and top rail - 1-5/8-inch O.D., Schedule 40/SS40.

Tension wire shall be 0.177 inch coiled spring wire tensioned along the bottom of the fabric and shall be coated similarly to the wire fabric.

Miscellaneous fittings and hardware shall be zinc coated commercial quality or better steel, or zinc coated cast or malleable iron as appropriate for the article.

Post caps, designed to provide a drive fit over the top of the tubular post to exclude moisture, shall be provided.

### **Section 15.03 - Installation**

#### **15.03.01 - Post Setting**

All posts shall be set in holes of diameter and depth as follows:

- a. End, corner and pull posts - 12-inch diameter, 3'6" deep, post 3' deep.
- b. Line posts - 10-inch diameter, 2'6" deep, post 2' deep.
- c. Gate posts - 15-inch diameter, 3'6" deep, 3' deep.

After the post has been set, aligned and plumbed, the hole shall be filled with 2,500 psi concrete. The concrete shall be thoroughly worked into the hole so as to leave no voids. The exposed surface of the concrete shall be crowned to shed water.

End, corner, pull and gate posts shall be braced to the nearest post with horizontal brace used as a compression member and a galvanized 3/8-inch steel truss rod and truss tightener used as a tension member. Corner posts and corner bracing shall be constructed at all changes of fence alignment of thirty (30) degrees or more. All chain link fence shall be constructed with a top rail and bottom tension wire.

#### **15.03.02 - Gates**

Swing gates shall be single hung or double hung as indicated on the plans and hinged to swing through one hundred eighty (180) degrees from closed to open and shall be complete with latches, locking device, stops keeper, hinges, fabric and braces. Gates shall be the same height as the fence and the gate fabric shall be the same as the fence fabric.

Gate leaves less than eight (8) feet wide shall have truss rods or intermediate braces and gate leaves eight (8) feet or more in width shall have intermediate braces and diagonal truss rods or shall have tubular members as necessary to provide rigid construction, free from sag or twist.

#### **15.03.03 - Placing Fabric**

The fabric shall not be placed until the posts have been permanently positioned and concrete foundations have attained adequate strength. The fabric shall be placed by securing one end and applying sufficient tension to remove all slack before making permanent attachments at intermediate points.

The fabric shall be fastened to all corner, end and pull posts by substantial and approved means. Tension for stretching the fabric shall be applied by mechanical fence stretchers.

#### **Section 15.04 - Electrical Grounds**

Wherever a power line passes over the fence, a ground shall be installed directly below the point of crossing. The ground rods shall consist of an aluminum or galvanized rod, with connection of similar metal if required, or of other appropriate material, eight (8) feet in length and at least 5/8-inch in diameter. The rod shall be driven vertically until the top of the rod is approximately six (6) inches below the ground surface. A No. 6 conductor shall be used to connect the rod and all fence elements. The conductor shall be connected to each fence element and the ground rod by means of electrical-type clamps which will prevent corrosion.

## ARTICLE 16

### GRASSING AND MULCHING

#### **Section 16.01 - Scope of Work**

The work specified in this Section shall consist of seeding and mulching of road shoulders, ditches, embankments and other areas left barren by construction to establish a dense stand of grass.

#### **Section 16.02 - Materials**

The grass seed shall be common Bermuda and Bahia. In addition, brown top millet will be included during summer months and annual rye in the winter months. The mulch shall consist of thoroughly shredded straw or hay. All seed shall meet the requirements of the State Department of Agriculture. The chemical composition of the fertilizer shall be 8-8-8 or other chemical composition specified in the plans.

#### **Section 16.03 - Construction Methods**

Construction methods shall be in accordance with Section 570 of the FDOT Standard Specifications.

Seed will be applied at not less than the following rate:

Bermuda	30 lbs. per acre
Bahia	120 lbs. per acre
Annual Rye	20 lbs. per acre (Oct. - March)
Brown Top Millet	20 lbs. per acre (April - Sept.)

Fertilizer shall be applied at the rate of 500 lbs. per acre.

#### **Section 16.04 - Sodding**

Sodding shall be in accordance with Section 575 of the FDOT Standard Specifications. Sod destroyed by construction will be replaced with existing type of grass. All sod shall be placed so as not to impede sheet flow off pavement.

1. 2 feet minimum sod behind curb is required for CoFC on subdivisions.
2. All areas with slopes will have "established" stand of sod at time of final inspections.
3. All grassing items shall be "established, living" at time of final inspection.



## ARTICLE 17

### **RESTORATION OF EXISTING RIGHT-OF-WAY**

#### **Section 17.01 - Description**

Restoration of existing right-of-way disturbed by the installation of utilities or adjacent construction projects shall be in conformance with the special conditions of the permit and this section of the Road Construction Specifications.

#### **Section 17.02 - Traffic Control**

Traffic control shall be in conformance with the Manual on Uniform Traffic Control Devices, the Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highway and The Florida Department of Transportation Roadway and Traffic Design Standards.

#### **Section 17.03 - Excavation**

Excavation shall be in accordance with Article 6 of these specifications.

#### **Section 17.04 - Utility Foundations**

Where the nature of the foundation materials is of poor supporting value, the foundation material shall be replaced with sand or other material, or as approved by the City Engineer. The foundation material shall be consolidated by mechanical methods to specified densities.

#### **Section 17.05 - Backfill and Compaction to Subgrade or Existing Ground**

Backfilling shall progress as rapidly as the construction and testing of the work will permit. All backfill material shall be suitable and free of deleterious material. The initial backfill shall be carefully deposited on both sides of the utility at the same time and uniformly compacted around the utility until enough has been placed to provide a cover of one (1) foot above utility at which time a density test shall be conducted. Material shall then be placed and compacted in two (2) foot lifts above the utility. In no case, shall backfill material be placed in the trench in a manner that will cause shock to, or unequal pressure on the utility. Under no conditions is construction debris, concrete, etc., to be included with the backfill.

#### **Section 17.06 - Compaction**

Compaction density testing shall be in accordance with Section 12.6 of these specifications.

Testing shall conform to the following:

- a. Under and within six (6) feet of the traveled way and under other existing hard surfaced or previously compacted areas. Compaction must be a minimum of ninety-eight (98) percent of maximum density as determined by AASHTO T-180.

- b. In all areas except for the above, compaction must be a minimum of ninety (98) percent of maximum density as determined by AASHTO T-180 or as directed by the City Engineer.

Density tests for determination of the specific backfill, base, etc., compaction shall be made by a Geotechnical Engineer at the expense of the permittee and reports submitted to the City Engineer.

#### **Section 17.07 - Base and Pavement Restoration**

Pavement or roadway surfaces cut or damaged shall be replaced with the same type material that existed at the time of removal, or as approved by the City Engineer, to like or better condition than existed prior to the construction.

Where existing pavement is to be removed, the surface shall be mechanically saw cut prior to trench excavation leaving a uniform and straightedge, with minimum disturbance to the remaining adjacent surface.

The base, during open cut restoration, shall be brought up to grade in accordance with the City of Winter Garden's Right-of-Way Utilization Regulations. Immediately following the specified backfilling, compaction, testing and base construction, the final surface restoration shall commence in accordance with the applicable detail, and as approved on the permit. Asphaltic material shall be replaced with the same type of material that existed at the time of removal and shall be a minimum of one (1) inch thick, or as approved by the City Engineer.

#### **Section 17.08 - Unpaved Street Restoration**

The top twelve (12) inches of the excavation shall be stabilized with a mixture of clay and sand to a condition equal to or better than existing surface. Compaction density of this layer shall be a minimum of ninety-eight (98) percent of maximum density as determined by AASHTO Specification T-180.

## ARTICLE 18

### SKIMMERS, WEIRS AND BAFFLES

#### **Section 18.01 - Scope of Work**

The work specified in this Section consists of the installation of floating material skimmers, blade weirs and structure baffles as called for on the approved plans.

#### **Section 18.02 - Materials**

Skimmers, weirs and baffles shall be constructed of fiberglass reinforced plastic. The skimmers, weirs and baffles shall include all materials including mounting fasteners, brackets, posts bonding adhesives, assembly fasteners, Class II concrete for posts and all other items necessary for the construction of the completed skimmer, weir or baffle.

Components of skimmer blades shall be fiberglass reinforced thermosetting resin, forty (40) percent nominal fiberglass content meeting the structural requirements as specified below. The resin shall be a corrosion resistant grade isophthalic polyester. The pigment shall be molded into the laminate throughout and be a color as selected by the Engineer. Thickness: composite skimmer and weir plates 3/16-inch minimum; posts 1/4-inch minimum.

#### **Physical Properties**

The fiberglass structural composite materials shall exhibit the following properties:

<u>Property</u>	<u>Test Method</u>	<u>Unit</u>	<u>Longitudinal</u>	<u>Transverse</u>
Tensile Strength	ASTM D638	PSI	30,000	7,000
Tensile Modulus	ASTM D638	PSI x 10	2.5	.8
Flexural Strength	ASTM D790	PSI	30,000	10,000
Flexural Modulus	ASTM D790	PSI x 10	1.6	.8
Izod Impact	ASTM D256	Ft-lb/in	28	4
Compressive Strength	ASTM D695	PSI	30,000	15,000
Compressive Modulus	ASTM D695	PSI	2.5	1.0
Shear Strength	ASTM D732	PSI	5,500	5,500
Coefficient of Thermal Expansion	ASTM D696	in/in/C°	5.2x10 <sup>-6</sup>	--
Water Absorption	ASTM D670	Max%	.6	--

#### **Composite Skimmer Blades**

Skimmer blades shall be fabricated from structural fiberglass flat plate and fiberglass angles. All joints may be epoxy bonded and non-metallic riveted following acceptable bonding procedures as specified by the manufacturer or shall be bolted using stainless steel hardware. All exposed machined edges will be post coated with a high performance edge sealer as provided by or specified by the manufacturer.

### **Support Brackets**

Support brackets will span the narrow part of the inlets and will be bonded structurally and riveted or bolted to the skimmer blade while an aluminum or stainless steel bolt will be attached at the shear flange.

### **Channel Brackets**

Channel brackets will be attached to the side of the concrete inlet and bonded and riveted or bolted to the skimmer blade.

### **Skimmer Post for Weirs**

Support post for weir designs shall be three (3) inches square tubing or three (3) inches diameter post. Fiberglass skimmer plate shall be attached to the posts by means of stainless steel thru bolts with washers. All posts shall be set in concrete.

### **Section 18.03 - Installation**

Skimmers, weirs and baffles shall be installed to the lines and grades shown on the approved plans and in accordance with the manufacturer's recommendations. Bonded field connections shall be made only under suitable weather conditions. Bolts shall be installed with heads to the outside of the structure when possible so as to present a smooth, snag-free surface. Protruding bolts which might constitute an injury hazard shall be cut and/or ground flush with the nuts.

All skimmers shall not touch any part of the slope or adjacent ground. If needed, a sodded swale shall be used to accommodate the skimmer. Six (6) inch minimum between the bottom of the skimmer and the pond side slope.

## **ARTICLE 19**

### **UNDERDRAIN**

#### **Section 19.01 - Scope of Work**

The Work specified in this Section consists of the construction of underdrain system. Such system shall be constructed in accordance with these specifications and in conformity with the plans.

#### **Section 19.02 - General**

Underdrain pipe is mandatory for all roadways. The type of underdrain pipe permitted shall be FDOT Type II or smooth wall HDPE pipe.

##### **19.02.01 - Excavating Trench**

Excavate the trench carefully, to the depth required to permit the pipe to be laid to the grade required, and to the dimensions shown in the plans.

##### **19.02.02 - Laying Pipe**

- a. General: Bed the pipe firmly on the bottom of the trench, with the perforations down and joints securely made.
- b. Protection of Drain Inlet: Protect the influent end of the pipe in a manner which will prevent any soil from entering the drain.
- c. Lateral Connections: Make lateral connections with prefabricated wyes, tees, elbows, etc., as required.
- d. Underdrain Inspection Box: Construct underdrain inspection boxes in accordance with the plans.
- e. Underdrain Cleanout Structures: Construct underdrain cleanout structures of in-line wye fittings and stub for access where called for in the plans.

##### **19.02.03 - Placing Filter Material and Backfilling**

- a. Placing Material: After laying the pipe and obtaining the Engineer's approval, backfill the trench with filter material to the lines shown on the plans.
- b. Compaction of Filter Material and Protection of Pipe: Place and compact the filter material around the pipe and for the full width of the trench, in layers not exceeding 6 inches in thickness. Take special care to avoid displacement or damage to the pipe.

- c. **Backfill Above Filter Material:** For all types of pipe, backfill the portion of the trench above the filter material with suitable pervious material. Place and compact the material in layers not exceeding 4 inches in thickness.

## ARTICLE 20

### RETAINING WALLS

#### Section 20.01 - Retaining Walls

1. All retaining wall designs and calculations shall be signed and sealed by a professional engineer registered in the State of Florida, and shall be provided to the City for review and approval.
2. A retaining wall shall be required for side yards where a 3:1 maximum slope can not be attained.
3. Wood retaining walls are prohibited in the City of Winter Garden.

## ARTICLE 21

### MAINTENANCE OF TRAFFIC

#### **Section 21.01 - Maintenance of Traffic**

1. The Maintenance of Traffic design, devices, implementation, construction, maintenance, etc. shall be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD), latest edition, and the Florida Department of Transportation Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways (Florida Green Book), latest edition.
2. The contractor shall submit a Maintenance of Traffic Plan to the City for review and approval two (2) weeks prior to construction.
3. The Maintenance of Traffic Plan shall be prepared, and signed and sealed by a professional engineer registered in the State of Florida.
4. The contractor shall provide Variable Message Signs or Boards (VMS) one (1) week in advance of any road closures in order to provide notice to the drivers.
5. The contractor shall be responsible for notifying the Police Department, the Fire Department, Lynx, Orange County Public Schools, and any others seventy two (72) hours prior to construction requiring lane closures or road closures.
6. The contractor's personnel, including flagmen and work zone supervisors, in charge of the Maintenance of Traffic implementation, operations, and other items, shall be certified through the Florida Department of Transportation in the applicable category.



## ARTICLE 22

### OVERTIME INSPECTION FEES

#### **Section 22.01 - Overtime Inspection Fees**

The Contractor shall reimburse the City for overtime inspection fees for the following:

1. Any work beyond 5:00 p.m. during any work day.
2. Any work of Saturdays.
3. Any items that require re-inspection by City inspectors.

The reimbursement cost shall be at the Standard City rates for inspector category and shall be made to the City within thirty (30) days of the inspection time.