RESOLUTION NO. 2000-M-14

A RESOLUTION RELATING TO ROAD CONSTRUCTION STANDARDS; ADOPTING ORANGE COUNTY ROAD CONSTRUCTION SPECIFICATIONS; REPEALING RESOLUTION 88-M-08; AND PROVIDING AN EFFECTIVE DATE.

RECITALS

WHEREAS, the Board of County Commissioners of Orange County, Florida, ("Board") has received recommendations in 2000 from the County Engineer and from Orange County Road Construction Advisory Board ("Advisory Board") concerning specifications and standards for road and highway construction; and

WHEREAS, the Board desires to amend the minimum standards for road and highway construction as previously established in Resolution 88-M-08 to be consistent with the recommendations of the Advisory Board.

BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF ORANGE COUNTY:

Section 1. Adoption of Orange County Road Construction Specifications. The minimum standards for road and highway construction in unincorporated Orange County shall be as set forth in Exhibit 1 which is attached hereto and incorporated herein.

Section 2. Repeal of Resolution 88-M-08. Orange County Resolution 88-M-08 pertaining to road construction standards is hereby repealed. However, projects submitted to the County for approval prior to the effective date of this Resolution which have been designed pursuant to the standards contained in Resolution 88-M-08 shall be evaluated under and be constructed consistent with the standards set forth in Resolution 88-M-08.
Section 3. **Severability.** If any part of this Resolution or the application of it to any person or circumstance is held invalid, the invalidity shall not effect the remaining provision or application which can be given effect without the invalid provision or application, and to this end, the provisions of the Resolution are declared severable.

Section 4. **Effective Date.** This Resolution shall take effective on January 1, 2001.
ORANGE COUNTY
ROAD
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ARTICLE 1

SHORT TITLE

This resolution shall be known as the Orange County Road Construction Specifications and shall be used to supplement the Orange County Subdivision Regulations.
ARTICLE 2

JURISDICTION

These regulations apply to all unincorporated areas of Orange County and County roads in incorporated areas. In addition, these regulations may be applied within any incorporated municipality in Orange County, provided the governing body of such municipality elects to come under the jurisdiction of this resolution.

Jurisdiction
Road Construction Specifications
ARTICLE 3

PURPOSE

These regulations are adopted for the following purpose of establishing the minimum standards of road and highway construction in Orange County. Any item not specifically addressed in these specifications shall be in accordance with the FDOT Standard Specifications. The Orange County Road Construction Advisory Board 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. C. C. - Board of County Commissioners, Orange County, Florida.

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 Orange County, 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 County.

County Engineer - The County Engineer of Orange County, 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.

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.

Orange County - Orange County, Florida.

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


Definitions
Road Construction Specifications
ARTICLE 5

CLEARING AND GRUBBING

Section 5.01 - Scope of Work

The work covered by this Section consists of clearing and grubbing and the removal of the resultant products and debris within the areas of the rights-of-way, easements, drainage facilities and all other construction areas.

Section 5.02 - Disposal of Materials

Material shall be disposed of in accordance with current County Regulations.
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 County 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 County Engineer.

Section 6.04 - Disposal of Excess Material

Excess material shall be disposed of in accordance with current County 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 twelve (12) inches in thickness, loose measure, for the full width and length of the embankment, and compacted to a minimum density of ninety-five (95) percent of the maximum density value as determined by AASHTO T-180. Testing should be performed for a minimum of 12,000 square feet and for every twenty-four (24) inch lift.
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.

Section 7.02 - Requirements:

7.02.01 - Under Limerock

Stabilize top six (6) inches to fifty (50) psi Florida Bearing Value (FBV) or a Limerock Bearing Ratio (LBR) of forty and compact to a minimum of ninety-five (95) percent of AASHTO T-180 for top twelve (12) inches.

7.02.02 - Under Soil Cement

Compact to a minimum of ninety-five (95%) percent of AASHTO T-180 for top twelve (12) inches.

7.02.03 - Under Curbs

Stabilize top six (6) inches to fifty (50) psi Florida Bearing Value (FBV) or a Limerock Bearing Ratio (LBR) of forty and compact to a minimum of ninety-five (95) percent of AASHTO T-180 for top twelve (12) 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 County 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 0.05 feet. 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

Tests for the subbase, LBR or FBV, 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 County 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 two (2) 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 Orange County.

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.

8.03.02 - Water

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

8.03.03 - Soil

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

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

Soil Cement Standards
Road Construction Specifications
Section 8.04 - Equipment

Soil cement 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

The specified quantity of Portland Cement required for full depth treatment shall be applied uniformly on the soil. When bulk cement is used, equipment suitable for handling, measuring and spreading the cement shall be used. The percentage of moisture in the soil, at the time of cement application, shall not exceed the quantity that will permit a uniform and intimate mixture of soil and cement during mixing operations and shall not exceed the specified optimum moisture content by more than two (2) percent for the soil cement mixture. No equipment, except that used to spread and mix the soil cement, will be allowed to pass over the freshly spread cement until it is mixed with the soil.

The operations from application of cement to finishing, inclusive shall be continuous and surface finishing shall be completed as soon as possible. Spread cement that has been displaced shall be replaced before mixing is started. No cement shall be applied when the soil or subgrade is frozen. The air temperature shall be at least forty (40) degrees Fahrenheit in the shade and rising.
After the cement has been applied, it shall be thoroughly mixed with the soil. Mixing shall continue until the cement has been thoroughly blended with the soil in order to prevent the formation of cement balls when water is applied. Any soil and cement mixture that has not been compacted and finished shall not remain undisturbed for more than thirty (30) minutes.

Section 8.07 - Batch, Mix Design, Field Construction and Specifications

The supplier shall submit a mix design, prepared by an independent Geotechnical Engineer, to the County Engineer for approval prior to use of the material for road construction. Also, the supplier shall monitor at the plant the batching and mixing of the material and submit to the County Engineer, when requested, reports prepared by a Geotechnical Engineer that the gradation, cement content and moisture content and other relevant design properties are in conformance with the approved mix design.

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 the County 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 & date of construction
- b. Average cement spread
- c. Uniformity of mix
- d. Moisture content at time of compaction
- e. Percent compaction
- f. Compacted Thickness
- g. 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 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-five (95) 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 ¼ 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 ¼ 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.

Soil Cement Standards
Road Construction Specifications
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 inch (1) will be evaluated by the County 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 asphalthic 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.

Soil Cement Standards
Road Construction Specifications
Section 8.17 - Final Inspection

Prior to applying the asphalt wearing surface, an inspection of the base shall be performed by the County Engineer, Geotechnical Engineer and Contractor. All deficiencies shall be corrected and approved by the County 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 County.
ARTICLE 9

LIMEROCK BASE

Section 9.01 - Scope of Work

The work specified in this Section consists of the construction of a base course composed of limerock. It shall be constructed on the prepared subgrade in accordance with these specifications and in conformity with the lines, grades, notes and typical cross sections shown on the plans. Where so shown on the plans, the base shall be constructed in two courses. Where the plans do not specify double-course base, the base may be constructed in either one or two courses.

Section 9.02 - Materials

The material used shall conform with the requirements as specified in the FDOT Standard Specifications. Other approved processed products may be considered as an equal to limerock.

Section 9.03 - Equipment

This work may be performed with any machine, combination of machines or equipment that will produce the specified results.

Section 9.04 - Transporting Limerock

The limerock shall be transported to the point where it is to be used, over rock previously placed and dumped on the end of the preceding spread. In no case, shall rock be dumped directly on the subgrade.

Section 9.05 - Spreading Limerock

The limerock shall be spread uniformly. All segregated areas of fine or coarse rock shall be removed and replaced with properly graded rock.

For double-course base, the rock shall be spread in two courses and the thickness of the first course shall be approximately one-half the total thickness of the finished base, or enough additional to bear the weight of the construction equipment without disturbing the subgrade.
Section 9.06 - Compacting and Finishing Base

For double course base, the first course shall be bladed, if necessary, to secure a uniform surface, and shall be compacted to the density specified below, immediately prior to spreading the second course. No other finishing of this course is required.

After spreading is completed, the entire surface shall be scarified and shaped so as to produce the exact grade and cross section after compaction. For double course bases, this scarifying shall extend to a depth sufficient to penetrate slightly the surface of the first course.

Proper moisture condition shall be maintained uniformly throughout the material during the compaction operation. The material shall be compacted to a minimum density of ninety-five (95) percent of the maximum density obtainable under AASHTO T-180. Where the base is being constructed in one course and the specified thickness is more than six (6) inches, the density specified above shall be obtained in both the bottom half and top half of the base. During final compacting operations, if blading of any areas is necessary to obtain the true grade and cross section, the compacting operations for such areas shall be completed prior to making the density determinations on the finished base.

The surface shall be "hard-planed" with a grader immediately prior to the application of the prime coat to remove the thin-glazed or cemented surface, leaving a granular or porous condition that will allow free penetration of the prime material. The materials planed from the base shall be removed from the base area.

If, at any time, the subgrade material should become mixed with the base course material, the Contractor shall excavate and remove the mixture, reshape and compact the subgrade, and replace the materials removed with clean base material, which shall be shaped and compacted as specified above.

Section 9.07 - Prime/Curing

When the limerock has been finished as specified herein, it shall be protected by the application of a bituminous coating. The bituminous material shall be applied as soon as possible after the completion of finishing operations. The Prime/Curing material shall be in accordance with Article 10 of these Specifications.
Section 9.08 - Testing Surface

The finished surface of the base course shall be checked with a template cut to the required cross section and with a fifteen (15) foot straight edge laid parallel to the centerline of the road or other approved testing devices. All irregularities greater than +1/4 inch shall be corrected by scarifying and removing or adding rock, as may be required, after which the entire area shall be recompacted as specified herein.

Section 9.09 - Tests

At least one of each of the following tests shall be made on every project by the Geotechnical Engineer:

a. Modified (AASHTO T-180) Proctor Maximum Density Determination Tests
b. Field In-Place Density Tests
c. Thickness

Tests for the subbase, LBR or FBV, 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 County 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 two (2) tests will be required per street and/or cul-de-sac.

Section 9.10 - Deficiencies

If deficiency in the density occurs, the base shall be reworked and recompacted until the density tests (AASHTO T-180) conform to these specifications.

Any deficiencies in thickness greater than 1/2 inch shall be completely reworked to conform to the original line and grade and specifications as shown on the original plans.
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.

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 ¼ inch less than the required average thickness. Thickness in excess of ¼ inch of the required average thickness shall be computed at the design thickness plus ¼ 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. Each core shall represent a section not longer than three hundred (300) feet. The average thickness shall be determined from the measured thicknesses.

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 locations designated by the County Engineer. All additional costs shall be borne by the contractor.

When the deficiency in thickness is in excess of ¼ 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 County Engineer) by overlaying. Normally, an overlay will not be permitted in a concrete curb section.
Section 10.04 - Mechanical Spreading & Screeding Equipment

Bituminous pavers shall be self-contained, self-propelled and can be steered. It shall be equipped with a receiving and discharging hopper capable of holding a minimum quantity of five (5) cubic yards of bituminous plant 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 county rights-to-way.

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 be between two hundred sixty (260) and three hundred ten (310) degrees Fahrenheit and shall not exceed three hundred thirty-five (335) degrees Fahrenheit at the plant.

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.

Asphaltic Concrete Surface Course
Road Construction 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 County 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 County. Vertical measurement from a string line between curbs 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 County 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 County 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 Orange County.

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

a. Extraction stability and gradation of combined aggregate - 1 test per 500 tons or part with a minimum of one per day. Bitumen content, stability and gradation of aggregates to conform to intent of job mix formula

b. Density and depth checks - one (1) test per three hundred (300) lineal feet of roadway (minimum 2 tests per street). Minimum acceptable density for each course of asphaltic concrete material shall be ninety-three (93) percent of the design unit weight in the job mix formula.

Asphaltic Concrete Surface Course
Road Construction Specifications
All tests and job mix formulas shall be made by a geotechnical engineer as approved by the County 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 County Engineer may require an extended warranty for acceptance.)

The following items may be required by the County Engineer:

a. Plant inspection and calibration check
b. Aggregate verification
c. Temperature control and verification
d. Test of asphalt cement content
e. Full-time construction monitoring
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 Pavement

11.02.01 - General

The bottom of the excavation for the pavement or top of the earth fill 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 slipforming 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 six (6) inches shall be composed of well drained granular soils that are predominantly sandy, mixed with no more silt or clay than required to obtain a Florida Bearing Value of thirty-five (35) psi plus or minus five (5) psi and be compacted to ninety-five (95) percent of maximum density in accordance with AASHTO T-180.

11.02.03 - Testing of Subgrade

Tests for subgrade stabilization shall be located no more than three hundred (300) feet apart and shall be staggered to the left, right and on the centerline of the roadway. Test reports for subgrade stabilization shall be submitted to the County Engineer by the Engineer of Record for review and approval prior to paving.

When, in the judgment of the County 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 County Engineer for approval prior to paving.

Section 11.04 - Equipment

11.04.01 - Forms

The pavement shall be place 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 County 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 County 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 Pavement

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:

<table>
<thead>
<tr>
<th>Type Development</th>
<th>Roadway Classification</th>
<th>Minimum Concrete Thickness</th>
</tr>
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<tbody>
<tr>
<td>Residential</td>
<td>Marginal Access</td>
<td>5&quot;</td>
</tr>
<tr>
<td></td>
<td>Local Street</td>
<td>5&quot;</td>
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<td></td>
<td>Minor Collector Street</td>
<td>5&quot;</td>
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<tr>
<td></td>
<td>Major Collector</td>
<td>6&quot;</td>
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<tr>
<td>Industrial and Commercial</td>
<td>Marginal Access</td>
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<td>Collector Street</td>
<td>8&quot;</td>
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</tbody>
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11.05.02 - 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 County Engineer. In this case, a 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 eighty (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 re-handling 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 County 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 County 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.

Portland Cement Concrete Pavement
Road Construction Specification
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 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 re-sprayed 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 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 County 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 County 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 2500 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 3000 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 County 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 hereafter described and of the sizes and dimensions shown on the plans.

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-361. 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 pipe. Joints for all round pipe within the limits of Orange County Right-of-Way 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 County Engineer.

12.02.02 - Corrugated Metal Pipe

Metallic coated corrugated steel pipe shall conform to the current AASHTO Standard Specification M-36 and current FDOT Standard Specifications for Road and Bridge Construction. Corrugated aluminum alloy pipe shall conform to the current AASHTO M-196 and current FDOT Standard Specifications for Road and Bridge Construction. All corrugated metal pipe installed shall have a continuous helical lock seam or a continuous welded helical seam. Riveted seam, spot-welded seams, or non-helical corrugated metal pipe shall not be installed under this specification.
Aluminum culverts can be specified if the soil pH is between 5.5 and 8.5 and soil resistivity is 1500 ohm-cm or greater, certified by a licensed Geotechnical Engineer. If soils fall outside these ranges, prior approval of storm drainage materials shall be obtained from the County Engineer.

Zinc coated steel sheets for corrugated metal pipe shall conform to the current AASHTO M-218.

Aluminum coated steel sheets for corrugated metal pipe shall conform to the current AASHTO M-244.

Zinc coated corrugated metal pipe and aluminum coated corrugated metal pipe shall conform to the current Type A bituminous coated corrugated metal culvert pipe AASHTO M-190.

The ends of all corrugated metal pipe shall be recorrugated and the pipe supplied with a metal banding system. The metal band system shall have a minimum width of one (1) foot and a rubber gasket or approved equal, which shall fit snugly in the space between the recorrugated end and metal band.

The jointing system shall prevent soil infiltrating into the pipe. Joints for all round pipe within the limits of Orange County Right-of-Way shall be wrapped with filter fabric. Joints for all arch 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 County Engineer.

12.02.03 - Polyvinyl Chloride and Corrugated Polyethylene 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. Corrugated Polyethylene Pipe shall meet the requirements at current AASHTO M-294. 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 infiltrating into the pipe. All joints within the limits of Orange County Right-of-Way shall be watertight in accordance with ASTM D-3212 and shall be wrapped with filter fabric. Joints outside Right-of-Way shall be either watertight in accordance with ASTM D-3212 or 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 County Engineer.
12.02.04 - Ductile Iron Pipe

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

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" unless specifically authorized otherwise by the County Engineer.

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:

<table>
<thead>
<tr>
<th>Pipe Diameter</th>
<th>Maximum Joint Opening</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>5/8&quot;</td>
</tr>
<tr>
<td>15</td>
<td>5/8&quot;</td>
</tr>
<tr>
<td>18</td>
<td>5/8&quot;</td>
</tr>
<tr>
<td>24</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>30</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>36</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>42</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>48</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>54</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>60</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>66</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>72</td>
<td>1&quot;</td>
</tr>
</tbody>
</table>

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 inch of closure, the dry pipe shall be removed and the joint remade.

12.03.02 - Corrugated Metal Pipe

The metal band shall be drawn together in conformance with the manufacturer's specification. The rubber gasket shall be uniformly compressed around the circumference of the pipe. Recorrugated ends and bands damaged shall be rejected and removed from the construction site.
12.03.03 - Polyvinyl Chloride and Corrugated Polyethylene 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 County Engineer, deflection measurement or testing may be required. Pipe 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 County Engineer.

12.03.04 - Pipe Inlet/Manhole Joints

The joints of pipe and inlet/manhole shall be carefully cleaned and completely filled with nonshrink 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" unless specifically authorized otherwise by the County Engineer.

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. 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 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-five (95%) 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 (90%) percent of maximum density as determined by AASHTO T-180, or as directed by the County Engineer. Under no condition is construction debris, concrete, etc., to be included with the backfill.

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 County 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 of pipe as a minimum. The Orange County 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 test at the spring line of the pipe
b. One test at an elevation one (1) foot above the pipe crown
c. One test for each two (2) feet of backfill placed above one (1) foot above the pipe crown to subgrade elevation

12.06.02 - Pipe Certification

A pipe certification shall be submitted to the County Engineer for all pipe furnished or as approved by the County 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.
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 3000 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 County 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.

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 nonshrink 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 pipe-inlet/manhole joint. The filter fabric shall be thoroughly bonded to the asphaltic mastic material.
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 I.

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 ¼ the depth of the concrete. Expansion joints shall be placed in sidewalks at driveways, sidewalk 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 ¼ 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 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 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.
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 ½ 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 ¼ 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 ASTM 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:

- **End, corner and pull posts** - 2 3/8" O.D. Schedule 40/SS 40
- **Line posts and gate frames** - 2" O.D. Schedule 40/SS 40
- **Gate Posts** - 4" O.D. Schedule 40/SS 40
- **Post braces and top rail** - 1 5/8" O.D. Schedule 40/SS 40

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:

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

After the post has been set, aligned and plumbed, the hole shall be filled with 2500 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 tightner 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:

<table>
<thead>
<tr>
<th>Grass</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bermuda</td>
<td>30 lb. per acre</td>
</tr>
<tr>
<td>Bahia</td>
<td>120 lb. per acre</td>
</tr>
<tr>
<td>Annual Rye</td>
<td>20 lb. per acre (Oct.-March)</td>
</tr>
<tr>
<td>Brown-Top Millet</td>
<td>20 lb. per acre (April-Sept.)</td>
</tr>
</tbody>
</table>

Fertilizer shall be applied at the rate of 500 lb. 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.
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


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 County Engineer. The foundation material shall be consolidated by mechanical methods to specified densities.

Section 17.05 - Backfill & 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 place to provide a cover of one foot above the 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 12.06 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-five (95) 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 (90) percent of maximum density as determined by AASHTO T-180 or as directed by the County 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 County 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 County 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 straight edge, with minimum disturbance to the remaining adjacent surface.

The base, during open cut restoration, shall be brought up to grade in accordance with Orange County'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 County 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-five (95) 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 ¼ inch minimum.

Physical Properties

The fiberglass structural composite materials shall exhibit the following properties.

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Unit</th>
<th>Longitudinal</th>
<th>Transverse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength</td>
<td>ASTM D638</td>
<td>PSI</td>
<td>30,000</td>
<td>7,000</td>
</tr>
<tr>
<td>Tensile Modulus</td>
<td>ASTM D638</td>
<td>PSIx10</td>
<td>2.5</td>
<td>.8</td>
</tr>
<tr>
<td>Flexural Strength</td>
<td>ASTM D790</td>
<td>PSI</td>
<td>30,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Flexural Modulus</td>
<td>ASTM D790</td>
<td>PSIx10</td>
<td>1.6</td>
<td>.8</td>
</tr>
<tr>
<td>Izod Impact</td>
<td>ASTM D256</td>
<td>Ft-lb/in</td>
<td>28</td>
<td>4</td>
</tr>
<tr>
<td>Compressive Strength</td>
<td>ASTM D695</td>
<td>PSI</td>
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<tr>
<td>Compressive Modulus</td>
<td>ASTM D695</td>
<td>PSI</td>
<td>2.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Shear Strength</td>
<td>ASTM D732</td>
<td>PSI</td>
<td>5,500</td>
<td>5,500</td>
</tr>
<tr>
<td>Coefficient of Thermal Expansion</td>
<td>ASTM D696</td>
<td>in/in/C°</td>
<td>5.2x10^-6</td>
<td>--</td>
</tr>
<tr>
<td>Water Absorption</td>
<td>ASTM D670</td>
<td>Max%</td>
<td>.6</td>
<td>--</td>
</tr>
</tbody>
</table>

Skimmers, Weirs and Baffles
Road Construction Specifications
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.