



# Public Works Manual

**Prepared BY  
Public Works Department  
Adopted March 2024**



## ***TABLE OF CONTENTS***

### **CHAPTER 1 INTRODUCTION**

- 1.1 AUTHORITY
- 1.2 ABBREVIATIONS
- 1.3 DEFINITIONS
- 1.4 PURPOSE
- 1.5 APPLICABILITY
- 1.6 AMENDMENTS
- 1.7 PERMITS
- 1.8 CODE OF ORDINANCE
- 1.9 EXPIRATION OF APPROVAL
- 1.10 WAIVER
- 1.11 ENFORCEMENT
- 1.12 REFERENCE TO STANDARD

### **SECTION 2 GENERAL REQUIREMENTS FOR CONTRACTORS**

- 2.1 PROJECT COORDINATION
  - 2.1.1 GENERAL
  - 2.1.2 CUTTING AND PATCHING
  - 2.1.3 TESTING LABORATORY SERVICES
  - 2.1.4 TEMPORARY FACILITIES AND CONTROL
    - 2.1.4.1 TEMPORARY WATER SUPPLY
    - 2.1.4.2 TEMPORARY SANITARY FACILITIES
    - 2.1.4.3 NOISE CONTROL
    - 2.1.4.4 DUST CONTROL
- 2.1 WATER CONTROL
- 2.2 POLLUTION, SILTATION, AND EROSION CONTROL
  - 2.2.1 GENERAL



- 2.2.2 STORMWATER POLLUTION PREVENTION PLAN (SWPPP)
- 2.2.3 LIMITATION OF EXPOSURE OF ERODIBLE-EARTH
  - 2.2.3.1 INCORPORATION OF EROSION CONTROL FEATURES
  - 2.2.3.2 SCHEDULING OF SUCCESSIVE OPERATIONS
- 2.2.4 DETAILS FOR TEMPORARY EROSION CONTROL FEATURE
  - 2.2.4.1 GENERAL
  - 2.2.4.2 TEMPORARY GRASSING
  - 2.2.4.3 TEMPORARY SOD
  - 2.2.4.4 TEMPORARY MULCHING
  - 2.2.4.5 SANDBAGGING
  - 2.2.4.6 SEDIMENT BASINS
  - 2.2.4.7 BERMS
  - 2.2.4.8 BALED HAY OR STRAW
  - 2.2.4.9 TEMPORARY SILT FENCES
    - 2.2.4.9.1 GENERAL
    - 2.2.4.9.2 MATERIALS AND INSTALLATION
    - 2.2.4.9.3 INSPECTION AND MAINTENANCE
  - 2.2.4.10 FLOATING TURBIDITY BARRIERS
  - 2.2.4.11 ROCK BAGS
  - 2.2.4.12 REMOVAL OF TEMPORARY EROSION CONTROL FEATURES
- 2.2.5 MAINTENANCE OF EROSION CONTROL FEATURES
  - 2.2.5.1 GENERAL
  - 2.2.5.2 MOWING
- 2.2.6 PROTECTION DURING SUSPENSION OF CONTRACT TIME
- 2.3 TRAFFIC CONTROL
  - 2.3.1 MATERIALS
    - 2.3.1.1 TEMPORARY TRAFFIC CONTROL DEVICES
    - 2.3.1.2 DETOUR
    - 2.3.1.3 COMMERCIAL MATERIALS FOR DRIVEWAY MAINTENANCE



## 2.3.2 SPECIFIC REQUIREMENTS

### 2.3.2.1 BEGINNING DATE OF CONTRACTORS RESPONSIBILITY

### 2.3.2.2 WORKSITE TRAFFIC SUPERVISOR

## 2.3.3 ALTERNATIVE TRAFFIC CONTROL PLAN

## 2.3.4 TRAFFIC CONTROL

### 2.3.4.1 STANDARDS

### 2.3.4.2 MAINTENANCE OF ROADWAY SURFACES

### 2.3.4.3 NUMBER OF TRAFFIC LANES

### 2.3.4.4 CROSSINGS AND INTERSECTIONS

### 2.3.4.5 ACCESS FOR RESIDENCES AND BUSINESS

### 2.3.4.6 PROTECTION OF THE WORK FROM INQUIRY BY TRAFFIC

### 2.3.4.7 FLAGGER

### 2.3.4.8 USE OF ORANGE VEST/GARMENTS

### 2.3.4.9 EXISTING PAVEMENT MARKINGS

### 2.3.4.10 NO WAIVER OF LIABILITY

## 2.3.5 DETOURS

### 2.3.5.1 GENERAL

### 2.3.5.2 CONSTRUCTION

### 2.3.5.3 CONSTRUCTION METHODS

### 2.3.5.4 REMOVAL OF DETOURS

### 2.3.5.5 DETOURS OVER EXISTING ROADS AND STREETS

### 2.3.5.6 TRAFFIC CONTROL OFFICER

## 2.3.6 DRIVEWAY MAINTENANCE

### 2.3.6.1 GENERAL

### 2.3.6.2 CONSTRUCTION METHODS

## 2.3.7 TEMPORARY TRAFFIC CONTROL DEVICES

### 2.3.7.1 INSTALLATION AND MAINTENANCE



2.3.7.2 WORK ZONE SIGNS

2.3.7.3 BUSINESS SIGNS

2.3.7.4 HIGH INTENSITY FLASHINGLIGHTS

2.3.7.5 WARNING/CHANNELIZING DEVICES

2.3.7.5.1 REFLECTIVE COLLARS FOR TRAFFIC CONES

2.3.7.5.2 BARRIER WALL (TEMPORARY)

2.4 CONTRACT CLOSEOUT

### **SECTION 3 - STREETS**

3.1 GENERAL

3.1.1 DESIGN REQUIREMENTS

3.1.2 RIGHT-OF-WAY WIDTH

3.1.3 LANE WIDTH

3.1.4 PAVEMENT CROSS SECTION

3.1.5 PAVEMENT RADII

3.1.6 TRAFFIC DESIGN

3.1.7 MAINTENANCE OF TRAFFIC DURING CONSTRUCTION

3.2 MATERIALS

3.2.1 STABILIZING MATERIALS

3.2.2 LIMEROCK BASE COURSE

3.2.3 CEMENTED COQUINA BASE COURSE

3.2.4 PAVEMENT SURFACING

3.2.5 ASPHALTIC CONCRETE

3.2.6 CURBING

3.2.7 SIDEWALK

3.2.8 SEED AND MULCH

3.3 CONSTRUCTION

3.3.1 CLEARING AND GRUBBING

3.3.2 PREPARATION OF SUBGRADE

3.3.3 STABILIZING OF SUBGRADE



3.3.4 LIMEROCK BASE CONSTRUCTION

3.3.5 FULL DEPTH RECLAMATION (FDR) WITH CEMENT BASE

3.3.6 PRIME COAT

3.3.7 TACK COAT

3.3.8 ASPHALT FRICTION COURSE

3.3.8.1WEATHER LIMITATIOS

3.3.8.2LIMITATION OF LAYING OPERATION

3.3.8.3APPLICATION OF THE ASPHALT PAVING OPERATION

3.3.8.4CONTROL TESTING REQUIREMENTS

3.3.8.5WHEN DEFICIENCY IS SERIOUSLY IN EXCESS

3.3.8.6WHEN DEFICIENCY IS NOT SERIOUSLY IN EXCESS

3.3.8.7CORRECTING DEFICIENCY BY ADDING NEW SURFACE MATERIAL

3.3.8.8CORE BORINGS

3.3.8.9CRITERIA FOR CALCULATIONS

3.3.9 LEVELING COURSE

3.3.9.1PATCHING DEPRESSIONS

3.3.9.2ROLLING PATCHING AND LEVELINF COURSES

3.3.9.3PATCHING POTHOLES

3.3.10RESURFACING COURSE

3.3.11CURBING

3.3.12 ADJUST MANHOLES AND CATCH BASINS TO GRADE

3.3.13 ADJUST GATE VALVE BOXES

3.3.14SIDEWALKS

3.3.15 SODDING

3.3.16 MISCELLANOUS ASPHALT PAVEMENT

3.3.17MICRO SURFACING

## **SECTION 4 - STORMWATER MANAGEMENT**

4.1 GENERAL

4.2 DEFINITIONS



#### 4.3 APPLICABILITY

#### 4.4 SUBMISSION REQUIREMENTS

##### 4.4.1 INFORMATION REQUIREMENTS

##### 4.4.2 SUBMITTAL TO OTHER AGENCIES

#### 4.5 HYDROLOGIC DESIGN CRITERIA

##### 4.5.1 ROADWAY DRAINAGE

##### 4.5.2 RETENTION/DETENTION FACILITY

#### 4.6 HYDRAULIC DESIGN CRITERIA

##### 4.6.1 ROADWAY DRAINAGE

##### 4.6.2 STORM SEWER DESIGN

##### 4.6.3 OPEN CHANNEL DESIGN

##### 4.6.4 DETENTION FACILITY OUTFALL DESIGN

### **SECTION 5 - DRAINAGE SYSTEM MATERIAL AND CONSTRUCTION**

#### 5.1 SCOPE

#### 5.2 PIPE

##### 5.2.1 REINFORCED CIRCULAR CONCRETE PIPE

##### 5.2.2 REINFORCED ELLIPTICAL CONCRETE PIPE

##### 5.2.3 CORRUGATED STEEL PIPE

##### 5.2.4 CORRUGATED ALUMINUM PIPE

##### 5.2.5 POLYETHYLENE PIPE

##### 5.2.6 PIPE CRADLE

#### 5.3 MANHOLES

##### 5.3.1 RECAST REINFORCED CONCRETE MANHOLES

##### 5.3.2 BRICK MANHOLES

##### 5.3.3 MANHOLE FRAMES AND COVERS

##### 5.3.4 BRICK

##### 5.3.5 CATCH BASIN

##### 5.3.6 CATCH BASIN FRAMES AND GRATES

##### 5.3.7 HEADWALLS, VALLEY GUTTERS, AND OTHER CONCRETE STRUCTURES



5.3.8 FRENCH DRAIN

5.3.9 CHECK DAM

5.4 CONSTRUCTION

5.4.1 ESCAVATION AND BACKFILL

5.4.2 PIPE LAYING

5.4.3 MANHOLES AND CATCH BASINS

5.4.4 FRENCH DRAINS

5.4.5 CHECK DAMS

## **SECTION 6 - TRANSPORTATION MANAGEMENT ELEMENT**

6.1 COMMERCIAL DEVELOPMENT

6.2 DESIGN CRITERIA

6.2.1 GENERAL SITE PLAN

6.2.2 RELATIONSHIP TO SURROUNDING PROPERTIES

6.2.3 PARKING

6.2.4 INTERIOR CIRCULATION

6.2.5 PEDESTRIAN CIRCULATION

6.2.6 TRASH COLLECTION AREAS

6.2.7 TRANSIT ACCOMMODATIONS

6.2.8 INDIVIDUAL IMPACT ANALYSIS

6.2.9 SIDEWALKS/BIKES PATHS

6.3 PRIVATE SINGLE FAMILY RESIDENTIAL DEVELOPMENT

## **APPENDIX: STANDARD DETAILS STANDARD ROAD**

STANDARD DRAINAGE STANDARD DRIVEWAY

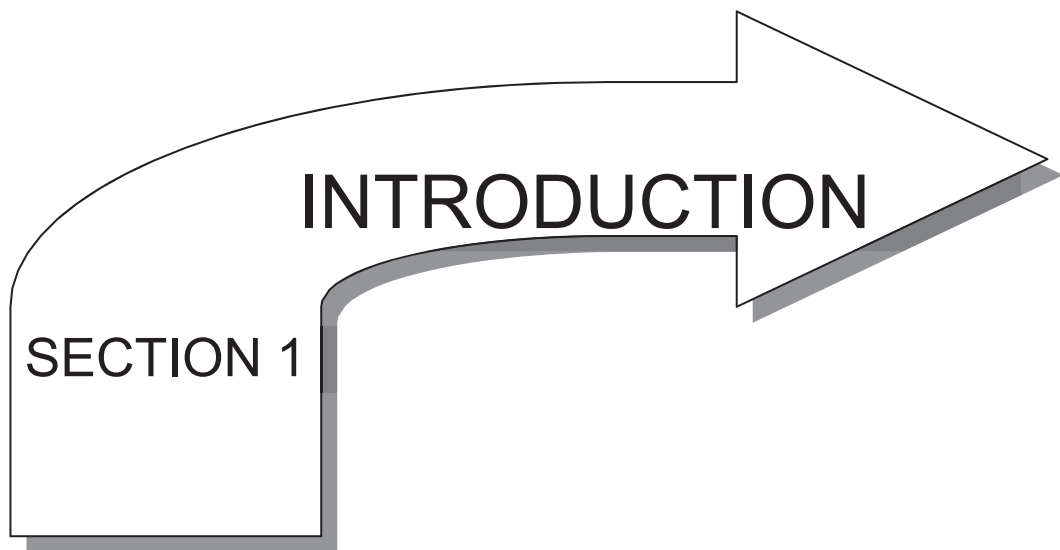
STANDARD

SIDEWALK

STANDARD SIGNS AND MARKINGS

CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN TEMPLATE PALM  
BAY STORMWATER ORDINANCE







## INTRODUCTION

### 1.1 AUTHORITY

This is the Public Works Manual of Construction Design Standards and Specifications, which is hereby adopted by resolution (dated March 2024) the City Council of the City of Palm Bay, Brevard County, Florida. The Public Works Department shall have full authority to implement the standards as established in this manual and shall have the authority to require that generally accepted Engineering standards and practices are adhered to. Any deviations from or conflicts with the standards herein or previously approved plans or permits shall be approved in writing by the Public Works Director, or designee prior to commencement of construction.

### 1.2 ABBREVIATIONS.

The following abbreviations, when used in the Contract Documents, represent text shown.

**AAN** American Association of Nurserymen, Inc.

**AASHTO** American Association of State Highway and Transportation Officials

**ACI** American Concrete Institute

**ACOE** Army Corp of Engineers

**AGC** The Associated General Contractors of America, Inc.

**AIA** American Institute of Architects.

**ANSI** American National Standards Institute, Inc.

**ASCE** American Society of Civil Engineers

**ASME** American Society of Mechanical Engineers

**ASTM** American Society for Testing and Materials

**AWG** American Wire Gauge

**AWWA** American Water Works Association

**CRSI** Concrete Reinforcing Steel Institute

**EPA** Environmental Protection Agency of the United States Government

**FDOT** Florida Department of Transportation

**FDEP** Florida Department of Environmental Protection

**FHWA** Federal Highway Administration

**FSS** Federal Specifications and Standards

**IEEE** Institute of Electrical and Electronics Engineers

**ISO** International Organization for Standards

**MSTCSD** Minimum Specifications for Traffic Control Signals and Devices

**MUTCD** Manual on Uniform Traffic Control Devices

**NEC** National Electrical Code

**NFPA** National Fire Protection Association

**NIST** National Institute for Standards and Technology

**NOAA** National Oceanic and Atmospheric Administration

**OSHA** Occupational Safety and Health Administration

**SAE** Society of Automotive Engineers

**SI** International System of Units

**UL** Underwriters' Laboratories



Each of the listed abbreviations, when followed by a number or letter designation, or combination of numbers and letters, designates a specification, test method, or other code or recommendation of the specified listed authority or organization shown. Use standards, specifications, test methods, or other codes as specified in the latest edition at the time of the construction.

### **1.3 DEFINITIONS**

The following terms, when used, have the meaning described.

#### **Architect**

The Architect as defined in s.481.203(3) Florida Statutes.

#### **Architect of Record**

The Architect or Architectural Firm registered in the State of Florida that performs services in connection with the design and construction of buildings.

#### **Architecture**

The practice of architecture as defined in s.481.203(6) Florida Statutes.

#### **Article**

The numbered prime subdivision of a Section of these Specifications.

#### **Bridge**

A structure, including supports, erected over a depression or over an obstruction such as water, highway, or railway, or for elevated roadway, for carrying traffic or other moving loads, and having a length, measured along the center of the roadway, of more than 20 feet between the inside faces of end supports. A multiple-span box culvert is considered a bridge, where the length between the extreme ends of the openings exceeds 20 feet.

#### **City**

The City of Palm Bay including all departments and divisions, representatives, and designees which may have jurisdiction over portion of the construction project.



**Change Order**

A written order to the Contractor signed by the Owner authorizing an addition, deletion or revision of the Work, or an adjustment in the Contract Price or the Contract Time issued on or after the Effective Date of the Agreement.

**Consultant**

A Professional Engineer or Engineering Firm, or the Architect or Architectural Firm, registered in the State of Florida and under contract to the Department or Owner to perform professional services. The consultant may be the Engineer or Architect of Record or may provide services through and be subcontracted to the Engineer or Architect of Record, i.e., environmental services, legal services, etc.

**Contract**

The term "Contract" means the entire and integrated agreement between the parties thereunder and supersedes all prior negotiations, representations, or agreements, either written or oral.

The Contract Documents form the Contract between the Department or Owner and the Contractor setting forth the obligations of the parties thereunder, including, but not limited to, the performance of the Work and the basis of payment.

**Contractor**

The individual, firm, joint venture or company contracting with the City to perform the work.

**Culverts**

Any structure not classified as a bridge structure that provides an opening under the roadway, driveway, pathway or between stormwater systems.

**Department**

City of Palm Bay Public Works Department

**Designer of Record**

The Architect of Record or the Engineer of Record (EOR).



## **Engineer**

The City of Palm Bay Public Works Department Engineer, acting directly or through duly authorized representatives; such representatives acting within the scope of the duties and authority assigned to them.

Note: In order to avoid cumbersome and confusing repetition of expressions in these Specifications, it is provided that whenever anything is, or is to be done, if, as, or, when, or where "acceptable, accepted, approval, approved, authorized, condemned, considered necessary, contemplated, deemed necessary, designated, determined, directed, disapproved, established, given, indicated, insufficient, ordered, permitted, rejected, required, reserved, satisfactory, specified, sufficient, suitable, suspended, unacceptable, or unsatisfactory," it shall be understood as if the expression were followed by the words "by the Engineer," "to the Engineer," or "of the Engineer."

## **Engineer of Record**

The Professional Engineer or Engineering Firm registered in the State of Florida that develops the criteria and concept for the project, performs the analysis, and is responsible for the preparation of the Contract Documents. The Engineer of Record may be Departmental in-house staff, or a consultant retained by the Department. The Contractor shall not employ the Engineer of Record as the Specialty Engineer.

## **Equipment**

The machinery and equipment, together with the necessary supplies for upkeep and maintenance thereof, and all other tools and apparatus necessary for the construction and acceptable completion of the work.

## **Extra Work**

Any "work" which is required by the Engineer to be performed and which is not otherwise covered or included in the project by the existing Contract Documents, whether it be in the nature of additional work, altered work, deleted work, work due to differing site conditions, or otherwise. This term does not include a "delay".

## **Highway, Street, or Road**

A general term denoting a public way for purposes of vehicular travel, including the entire area within the right of way.

## **Holidays**

Days designated by the City of Palm Bay as holidays, which include, but are not limited to, New Year's Day, Martin Luther King's Birthday, President's Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day and the following Friday, and Christmas Day.



**Inspector**

An authorized representative of the Engineer, assigned to make official inspections of the materials furnished and of the work performed by the Contractor.

**Laboratory**

The official testing laboratory used by the Department.

**Materials**

Any substances to be incorporated in the work under the Contract.

**Median**

The portion of a divided highway or street separating the traveled ways for traffic moving in opposite directions.

**Owner**

Client that has entered into an agreement with the Designer of Record for development of plans and specifications and a contractor through the contract documents.

**Plans**

The approved drawings, including the reproductions thereof, showing the site, location, character, dimensions, and details of the construction work.

**Right-of-Way**

The land that the Department has title to, or right of use, for the road and its structures and appurtenances, and for material pits furnished by the Department.

**Roadbed**

The portion of the roadway occupied by the sub-grade and shoulders.

**Roadway**

The portion of a highway within the limits of construction.

**Section**

A numbered prime division of these Specifications.



## **Shoulder**

The paved or paved portion of the roadbed outside the edges of the travel way or back of curb and extending to the top of front slopes.

machinery and equipment, together with the necessary supplies for upkeep and maintenance thereof, and all other tools and apparatus necessary for the construction and acceptable completion of the work.

## **Special Provisions**

The specific clauses adding or revising the standard specifications, setting forth conditions varying from or additional to the FDOT standard specifications.

## **Specialty Engineer**

A Professional Engineer registered in the State of Florida, other than the Engineer of Record or his subcontracted consultant, who undertakes the design and drawing preparation of components, systems, or installation methods and equipment for specific portions of the project work. The Specialty Engineer may be an employee or officer of the Contractor or a fabricator, an employee or officer of an entity providing components to a fabricator, or an independent consultant. A Specialty Engineer is qualified if he has the following qualifications:

1. Registration as a Professional Engineer in the State of Florida.
2. Education and experience necessary to perform the design by a Florida Registered Professional Engineer.

## **Specifications.**

The directions, provisions, and requirements contained herein, together with all other required stipulations contained in the Contract Documents, setting out or relating to the method and manner of performing the work, or to the quantities and qualities of materials and labor to be furnished under the Contract.

- Development Specification: A specification developed around a new process, procedure, or manual.
- Special Provisions: Specific clauses adding to or revising the standard specifications, setting forth conditions varying from or additional to the standard specifications.
- Supplemental Special Provisions: Additions and revisions to the contract documents issued prior to the bid opening know as addendum.
- Supplemental Specifications: Additions and revisions to the standard specifications.
- Technical Special Provisions: Specifications prepared, signed, and sealed by a Florida Registered Professional Engineer that are made part of the contract as an attachment to the contract documents.



**State**

State of Florida.

**Sub-article**

A headed and numbered subdivision of an Article of a Section of this Manual.

**Sub-grade**

The portion of the roadbed is immediately below the base course or pavement, including below the curb and gutter, valley gutter, shoulder, and driveway pavement. The sub-grade limits ordinarily include those portions of the roadbed shown in the plans to be constructed to a design bearing value or to be otherwise specially treated. Where no limits are shown in the plans, the sub-grade section extends to a depth of 12 inches below the bottom of the base or pavement and outward to 6 inches beyond the base, pavement, or curb and gutter.

**Substructure**

All of the bridge structures below the bridge seats, which include the parapet, back-walls and wing-walls of the abutments.

**Superintendent**

The Contractor's authorized representative in responsible charge of the work.

**Superstructure**

The entire bridge structure above the substructure, including anchorage and anchor bolts, but excluding the parapets, back-walls, and wing-walls of abutments.

**Supplemental Agreement**

A written agreement between the contractor and the city and signed by the surety, modifying the contract within the limitations set forth in this manual.

**Supplemental Special Provisions**

Additions and revision to the contract documents issued prior to the bid opening (also known as an addendum).

**Supplemental Specifications**

Additions and revisions to the Standard Specifications.



## **Surety**

The corporate body that is bound by the Contract Bond with and for the Contractor and responsible for the performance of the contract and for payment of all legal debts pertaining thereto.

## **Technical Special Provisions**

Specifications prepared, signed and sealed by a Florida Registered Professional Engineer other than the Engineer of Record of his designee, that are made part of the contract as an attachment to the contract document.

## **Traveled Way**

The portion of the roadway providing for the movement of vehicles, exclusive of the paved shoulders and auxiliary lanes.

## **Work**

All labor, materials and incidentals required to execute and complete the requirements of the contract including superintendence, use of equipment and tools, and all services and responsibilities prescribed schedule.

## **Working Day**

Any calendar day on which the Contractor works or is expected to work in accordance with the approved contract work schedule.

## **1.4 PURPOSE**

It is intended that this manual shall provide the design and construction standards for the purpose of providing the citizen of Palm Bay with a high quality, low maintenance, public facilities.

## **1.5 APPLICABILITY**

All residential subdivisions shall be designed and constructed in accordance with these standards whether they are intended to be public or private maintained.

All Planned Unit Development (PUD), commercial, multi-family or industrial developments shall be designed and constructed in accordance with these standards with exception only noted in this text or agreed to by the City Engineer for approval.

All streets and related facilities that are created by dedication shall be designed and constructed in accordance with these standards whether they are intended to be public or private maintained.

All projects constructed by and/or constructed for the City shall be designed and constructed in accordance with these standards.



## **1.6 AMENDMENTS**

Amendments and additions may be made to this manual as needed. Changes may be made at any time and any revisions or additions are made, the appropriate pages shall have a supplement number, be dated and initialed. These changes made shall become effective upon approval of resolution by City Council.

## **1.7 PERMITS**

Developers, their engineers, and contractors, are responsible for obtaining all applicable federal, state, and local permits. Verifications that certain permits have been issued may be required prior to approval by the City Engineer. However, the approval of construction plans and related documents in no way implies that all other approvals have been received from other agencies.

## **1.8 CODE OF ORDINANCES**

All development and construction must meet applicable requirements as specified in the City of Palm Bay Code of Ordinances. Such applicable areas include, but are not limited to solid waste, Floodplain Management, Stormwater Management, Streets, Public Improvements, Subdivision, Driveway Permits, Right-of-Way Use, Mining, Utilities, and Zoning requirements.

## **1.9 EXPIRATION OF APPROVAL**

All construction plans are valid for one (1) year from the date of approval. The date of approval shall be the date that the Public Works Engineer (or Site Plan Coordinator in the Growth Management Department, Growth Management Director, or Designee in the case of site plans) signs the construction drawings. If construction has not started within the one (1) year time period, the plans must be resubmitted for review and approval will be contingent upon complying with currently adopted standards. In addition, once construction has begun, it must continue for the plan approval to remain valid. It is not intended that the City will be unreasonable in determining whether construction has continued. If a building permit is also involved, the expiration of that permit shall be reason for expiration of approval of the construction drawings. Clearing and grubbing does not constitute construction. Separate clearing permits shall be acquired and adhered to. Residential lot permits can be obtained from the Public Works Department. All other properties shall obtain permits through the Growth Management Department. If there are any questions about whether construction has started and continued, the Department Engineer will make the final decision. This requirement applies to all plans not currently approved for construction.

## **1.10 WAIVER**

The Palm Bay Board of Adjustment may waive the requirements of this manual based on provided documentation and staff recommendation when literal or strict enforcement of the terms or provisions of this manual would cause unnecessary, unusual, or exceptional hardship as determined by the Public Works Director.



### **1.11 ENFORCEMENT**

The City of Palm Bay Public Works Department and its designated representatives shall have the right to inspect the construction projects affected by this manual and to issue notices to comply for any violations.

The City of Palm Bay has the right to seek appropriate injunctive relief for the purpose of enforcing the requirements of this manual. Any person, firm, or corporation, either individually or through its agents, employees, or independent contractors, who violate the provisions of this manual shall be subject to the penalty contained in Chapter §10.99 in the Code of Ordinances governing the City of Palm Bay.

### **1.12 REFERENCE TO STANDARD**

Whenever reference is made to the furnishing of materials or testing thereof to confirm to the standards of any technical society, organization, or body, it shall mean the standard, code, specification, or tentative specification adopted in this Manual.



GENERAL REQUIREMENTS FOR  
CONTRACTORS  
SECTION 2



## **SECTION 2: GENERAL REQUIREMENTS FOR CONTRACTORS**

The Plans and Specifications are an integral part of the Contract Documents and as such will not stand alone if used independently. The Plans and Specifications establish minimum standards. They do not support covering all details entering into the design and construction of materials or equipment.

### **2.1 PROJECT COORDINATION**

#### **2.1.1 General**

The contractor shall provide for the complete coordination of the construction. This shall include but not necessarily be limited to coordination of the following:

- (1) The flow of material and equipment from suppliers.
- (2) The interrelated work with utilities.
- (3) The effort of independent testing agencies in compliance with these specifications.
- (4) Notification to all appropriate agencies for required inspections, including but not limited to City of Palm Bay Departments, Palm Bay Utilities, Melbourne-Tillman Water Control District, St. Johns River Water Management District (SJRWMD), Florida Power and Light Company, BellSouth, Bright House, Florida Department of Environmental Protection, Florida Fish and Wildlife Conservation Commission and the U.S. Army Corps of Engineers.

#### **2.1.2 Cutting and Patching**

The Contractor shall do all cutting, fitting, and patching of his work that may be required to make its several parts come together properly and integrate with such other work. The Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of those whose work will be affected.

#### **2.1.3 Testing Laboratory Services**

Arrangements for testing laboratory services will be made by the owner. Payment for testing to show compliance with specified requirements will be paid by the owner/contractor. The cost of retesting when materials and workmanship fail to meet specified requirements will be deducted from monies due the Contractor on City funded projects.

#### **2.1.4 Temporary Facilities and Control**

##### **2.1.4.1 Temporary Water Supply**

The Contractor shall make all necessary applications and arrangements and pay all fees and charges for potable water necessary for the proper completion of the project up to



the time of final acceptance. The Contractor shall provide and pay for any temporary piping and connections.

#### **2.1.4.2 Temporary Sanitary Facilities**

The Contractor shall provide adequate sanitary facilities for the use of those employed on the work site. Such facilities shall be made available when the first employees arrive on the site of the work, shall be properly secluded from public observation, isolated from waterways and storm sewer systems, and shall be constructed and maintained during the progress of the work in suitable numbers and at such points and in such manner as may be necessary.

#### **2.1.4.3 Noise Control**

The Contractor shall provide adequate protection against objectionable noise cause by the operation of construction equipment. Chapter 92 of the City of Palm Bay Code of Ordinances shall be enforced.

#### **2.1.4.4 Dust Control**

The Contractor shall provide adequate protection against raising objectionable dust clouds caused by moving construction equipment, high winds, or any other cause. Disturbed soils that have not been worked in more than seven (7) days shall be vegetated with seed and mulch or sod.

#### **2.1.4.5 Water Control**

The Contractor shall provide for all aspects of his/her work so that it shall not endanger the public or private lands adjacent to the site. The Contractor shall provide for satisfactory disposal of surplus water and shall submit a plan to the Engineer for his/her review prior to initiation and implementation of the plan.

Prior to any approval, the contractor shall obtain permits from the proper authorities for the use of public or private lands or facilities for such disposal, in accordance with SJRWMD 40-22 "Consumption Use Permit Dewatering".

### **2.2 POLLUTION, SILTATION, AND EROSION CONTROL**

#### **2.2.1 General**

The Contractor shall provide for and take sufficient precautions for erosion control measures on the project and in areas outside the right-of-way where work is accomplished in conjunction with the project, so as to prevent pollution of water, detrimental effects to public or private property adjacent to the project right-of-way and damage to work on the project. The contractor shall construct and maintain temporary erosion control features or, where practical, construct and maintain permanent erosion control features as shown in the plans or as may be directed by the Department.



The Contractor shall take sufficient precautions to prevent pollution of private lands, reservoirs, ponds, rivers, streams, creeks, etc. by disposals of surplus materials in the forms of solids, liquids, or gases including but not limited to fuels, oils, bitumen, calcium chloride or other harmful materials. The Contractor shall conduct and schedule operations so as to avoid or otherwise minimize pollution or siltation of streams, lakes, and reservoirs and to avoid interference with any fish and wildlife. Restrict construction operations in rivers, streams, lakes, tidal waters, reservoirs, canals, and other water impoundments to those areas where it is necessary to perform filling or excavation to accomplish the work shown in the plans and to those areas which must be entered to construct temporary or permanent structures. As soon as conditions permit, promptly clear rivers, streams, and impoundments of all obstructions placed therein or caused by construction operations.

Coordinate the installation of temporary erosion control features with the construction of the permanent erosion control features to the extent necessary to endure control features to the extent necessary to ensure economical, effective, and continuous control of erosion and water pollution throughout the life of the Contract.

Due to unanticipated conditions, the Designer of Record may direct the use of control features or methods other than those included in the original contract. In such event, the city will pay for this additional work as unforeseen work.

Do not frequently ford live streams with construction equipment. Whenever an appreciable number of stream crossings are necessary at any one location, use a temporary bridge or other structure.

Except as necessary for construction, do not deposit excavated material in rivers, streams, canals, or impoundments, or in a position close enough thereto, to be washed away by high water or runoff. Where pumps are used to remove highly turbid waters from enclosed construction areas such as cofferdams or forms, treat the water by one or more, but not limited to, of the following methods prior to discharge into State waters: pumping into grassed swales or appropriate vegetated areas or sediment basins, or confined by an appropriate enclosure such as turbidity barriers when other methods are not considered appropriate. The use of polyacrylamides may be necessary to ensure that the discharged waters do not exceed the natural background conditions of receiving water bodies by more than 29 Nephelometric Turbidity Units (NTU's) per 62-302.530 F.A.C.

Do not disturb lands or waters outside the limits of construction as staked, except as authorized by the city.

Obtain the Designer of Record's approval for the location of, and method of operation in, borrow pits, material pits, and disposal areas furnished for waste material from the project (other than commercially operated sources) such that erosion during and after completion of the work will not result in probability of detrimental siltation or water pollution.

The Contractor may use new or used materials for the construction of temporary silt fence, staked turbidity barriers, and floating turbidity barrier not to be incorporated into the completed project, subject to the approval of the Department.



## **2.2.2 Stormwater Pollution Prevention Plan (SWPPP)**

At the Preconstruction Meeting, provide to the City a special plan to prevent, control, and reduce erosion and water pollution, meeting the requirements or special conditions of all permits authorizing project construction.

When a National Pollutant Discharge Elimination System (NPDES) Permit is issued or approved by the Florida Department of Environmental Protection, the Contractor's plan shall be prepared as a part of the approved SWPPP. The SWPPP will include this erosion control plan and all additional measures that will be employed to dispose of, control, or prevent the discharge of solid, hazardous, and sanitary wastes to waters of the U.S.

Include procedures to control off-site tracking of soil by vehicles and construction equipment and a procedure for cleanup and reporting of non-storm water discharges, such as contaminated groundwater or accidental spills. The Department will review and approve the Contractor's part of the SWPPP, including required signed certification statements, before soil disturbing activities begin.

Failure to sign any required documents or certification statements will be considered a default of the Contract. Any earth disturbing activities performed without the required signed documents or certification statements may be considered a violation of the Clean Water Act by the EPA.

When the SWPPP is required, prepare the erosion control plan in accordance with the sequence of operations and present in the NPDES Stormwater Pollution Prevention Plan required format provided by the FDEP. The erosion control plan shall describe, but not be limited to, the following items or activities:

- (1) For each phase of construction operations or activities, supply following: Locations of all erosion control.
- (2) For each phase of construction operations or activities, supply following information:
  - (a) Locations of all erosion control devices
  - (b) Types of all erosion control devices
  - (c) Estimated time erosion control devices will be in operation.
  - (d) Monitoring schedules for maintenance of erosion control devices
  - (e) Methods of maintaining erosion control devices
  - (f) Containment or removal methods for pollutants or hazardous wastes
- (3) The name and telephone number of person responsible for monitoring and maintaining the erosion control devices.
- (4) Submit for approval the erosion control plans meeting paragraphs 3A and/or 3B below:
- (5) Projects permitted by the St. Johns River Water Management District, require the following: Obtain the Department's approval of the erosion control plan. Do not begin construction activities until the erosion control plan receives written approval from the Engineer. Provide copy of notice of intent approval.



- (6) Project authorized by permitting agencies other than the Water Management Districts or projects for which no permits are required, require the following:
- (7) The Department will review and approve the Contractor's erosion control plan. Do not begin construction activities until the erosion control plan receives written approval from the Department. Comply with the approved erosion control plan.

### **2.2.3 Limitation of Exposure of Erodible Earth**

The Department may limit the surface areas of unprotected erodible earth exposed by the construction operation and may direct the Contractor to provide erosion or pollution control measures to prevent contamination of any river, stream, lake, tidal waters, reservoir, canal, or other water impoundments or to prevent detrimental effects on property outside the project right-of-way or damage to the project. Limit the area in which excavation and filling operations are being performed so that it does not exceed the capacity to keep the finish grading, grassing, sodding, and other such permanent erosion control measures current in accordance with the accepted schedule.

Do not allow the surface area of erodible earth that clearing and grubbing operations or excavation and filling operations expose to exceed 750,000 ft<sup>2</sup> 17.2 acres without specific prior approval by the Department. This limitation applies separately to clearing and grubbing operations and excavation and filling operations. The Department may increase or decrease the amount of surface area the Contractor may expose at any one time.

#### **2.2.3.1 Incorporation of Erosion Control Features**

Incorporate permanent erosion control features into the project at the earliest practical time. Use approved temporary erosion control features to correct conditions that develop during construction which were not foreseen at the time of design, to control erosion prior to the time it is practical to construct permanent control features, or to provide immediate temporary control of erosion that develops during normal construction operations, which are not associated with permanent erosion control features on the project.

The Department may authorize temporary erosion control features when Topsoil is specified in the Contract and the limited availability of that material from the grading operations will prevent scheduled progress of the work or damage the permanent erosion control features.

#### **2.2.3.2 Scheduling of Successive Operations**

Schedule operations such that the area of unprotected erodible earth exposed at any one time is not larger than the minimum area necessary for efficient construction operations, and the duration of exposure of uncompleted construction to the elements is as short as practicable.

Schedule and perform clearing and grubbing so that grading operations can follow immediately thereafter. Schedule and perform grading operations so that permanent erosion control features can follow immediately thereafter if conditions on the project permit.



## **2.2.4 Details for Temporary Erosion Control Features**

### **2.2.4.1 General**

Use temporary erosion and water pollution control features that consist of, but are not limited to, temporary grassing, temporary sodding, temporary mulching, sandbagging, slope drains, sediment basins, sediment checks, berms, baled hay or straw, floating turbidity barrier, staked turbidity barrier and silt fence. For design details for some of these items, refer to the latest FDOT Design Standards Index 100 through 106.

### **2.2.4.2 Temporary Grassing**

The Engineer may designate certain areas of grassing constructed in accordance with the latest FDOT Standard Specification Section 570 as temporary erosion control measures.

### **2.2.4.3 Temporary Sod**

Furnish and place sod in accordance with FDOT Standard Specifications Section 575 within areas designated by the Engineer to temporarily control erosion. If the Engineer determines that the sod will be of a temporary nature, he may not require fertilizer and lime. Keep the sod in a moist condition to ensure growth.

### **2.2.4.4 Temporary Mulching**

Furnish and apply a 2- to 4-inch-thick blanket of straw or hay mulch to designated areas, then mix, or force the mulch into the top 2 inches of the soil in order to temporarily control erosion. Use only undecayed straw or hay which can readily be cut into the soil, and which otherwise complies with FDOT Standard Specifications Section 981-3. The Contractor may substitute other measures for temporary erosion control, such as hydro mulching, chemical adhesive soil stabilizers, etc., for mulching with straw or hay, if approved by the Engineer. When beginning permanent grassing operations, plow under temporary mulch materials in conjunction with preparation of the ground.

### **2.2.4.5 Sandbagging**

Furnish and place sandbags in configurations to control erosion and siltation.

### **2.2.4.6 Sediment Basins**

Construct sediment basins in accordance with the details shown in the plans, the Design Standards, or as may be approved as suitable to adequately perform the intended function. Clean out sediment basins as necessary in accordance with the plans or as directed.

### **2.2.4.7 Berms**

Construct temporary earth berms to divert the flow of water from an erodible surface.

### **2.2.4.8 Baled Hay or Straw (Not Allowed)**

BioFence is a biodegradable siltation fencing to meet FDEP standards for erosion control. BioFence is designed to replace hay bales and plastic silt fencing in erosion control applications. The product is easy to install and is biodegradable - it can be left in place at project completion.



## **2.2.4.9 Temporary Silt Fences**

### **2.2.4.9.1 General**

Furnish, install, maintain, and remove temporary silt fences, in accordance with the manufacturer's directions, these Specifications, the details as shown on the plans, and the Design Standards.

### **2.2.4.9.2 Materials and Installation**

Use a geotextile fabric made from woven or nonwoven fabric, according to those applications for erosion control. Choose the type and size of posts, wire mesh reinforcement (if required), and method of installation. Do not use products which have a separate layer of plastic mesh or netting. Provide a durable and effective temporary silt fence that controls sediment comparable to FDOT Design Standards, Index No. 102.

Install all sediment control devices in a timely manner to ensure the control of sediment and the protection of lakes, streams, gulf or ocean waters, or any wetlands associated therewith and to any adjacent property outside the right-of-way as required.

At sites where exposure to such sensitive areas is prevalent, complete the installation of any sediment control device prior to the commencement of any earthwork. After installation of sediment control devices, repair portions of any devices damaged at no expense.

Erect temporary silt fence at upland locations across ditch lines and at temporary locations shown on the plans or approved by the Engineer where continuous construction activities change the natural contour and drainage runoff. Do not attach temporary silt fence to existing trees unless approved by the Engineer.

### **2.2.4.9.3 Inspection and Maintenance**

Inspect all temporary silt fences immediately after each rainfall and at least daily during prolonged rainfall. Immediately correct any deficiencies. In addition, make a daily review of the location of silt fences in areas where construction activities have changed the natural contour and drainage runoff to ensure that the silt fences are properly located for effectiveness. Where deficiencies exist, install additional silt fences as directed by the Engineer.

Remove sediment deposits when the deposit reaches approximately 1/2 of the volume capacity of the temporary silt fence or as directed by the Engineer. Dress any sediment deposits remaining in place after the temporary silt fence is no longer required to conform with the finished grade and prepare and seed.

Maintain record of inspection dates, corrective actions, and changes to the SWPPP.

### **2.2.4.10 Floating Turbidity Barriers and Staked Turbidity Barriers**

Install, maintain, and remove turbidity barriers to contain turbidity that may occur as the result of dredging, filling, or other construction activities which may cause turbidity to occur in the waters of the State. The Contractor may need to deploy turbidity barriers around isolated areas of concern such as seagrass beds, coral communities, etc. both within as well as outside the right- of-way limits. The Engineer will identify such areas. Place the barriers prior to the commencement of any work that could impact the area of concern.



Install the barriers in accordance with the details shown in the plans or as approved by the Engineer. Ensure that the type of barrier used, and the deployment and maintenance of the barrier will minimize dispersion of turbid waters from the construction site. The Engineer may approve alternate methods or materials.

#### **2.2.4.11 Rock Bags**

Furnish and place rock bags to control erosion and siltation. Place the bags as shown in the plans, the Design Standards or as directed by the City Engineer. Use a fabric material with openings that are clearly visible to minimize clogging yet small enough to prevent rock loss. Use material of sufficient strength to allow removing and relocating bags without breakage. The bag size when filled with rocks shall be approximately 12 by 12 by 4 inch. Use No. 4 or No. 5 coarse aggregate rock.

#### **2.2.4.12 Removal of Temporary Erosion Control Features**

In general, remove or incorporate into the soil any temporary erosion control features existing at the time of construction of the permanent erosion control features in an area of the project in such a manner that no detrimental effect will result. The Engineer may direct those temporary features to be left in place. Remove sediment deposits and restore any damaged areas incurred by erosion and sediment control features.

### **2.2.5 Maintenance of Erosion Control Features**

#### **2.2.5.1 General**

Provide routine maintenance of permanent and temporary erosion control features, at no expense to the City, until the project is complete and accepted. If reconstruction of such erosion control features is necessary due to the Contractor's negligence or carelessness or, in the case of temporary erosion control features, failure by the Contractor to install permanent erosion control features as scheduled, the Contractor shall replace such erosion control features at no expense.

Inspect all erosion control features at least once every seven calendar days and within 24 hours of the end of a storm of 0.50 inches or greater. Maintain all erosion control features as required in the Stormwater Pollution Prevention Plan and as specified in State and/or Federal environmental regulatory permits. The stabilization of disturbed areas shall be performed within 7 days. The City Inspector to report all inspection findings and to document all corrective measures taken from the inspection. Sign each inspection report and submit it weekly to the Project Manager or Engineer.

#### **2.2.5.2 Mowing**

The Inspector may direct mowing of areas within the limits of the project. Mow these designated areas within seven days of receiving such order. Do not mow slopes that are steeper than three horizontals to one vertical.

#### **2.2.6 Protection During Suspension of Contract Time**

If it is necessary to suspend the construction operations for any appreciable length of time, shape the top of the earthwork in such a manner to permit runoff of rainwater, and construct earth berms along the top edges of embankments to intercept runoff water. Provide temporary slope drains to carry runoff from cuts and embankments that are in



the vicinity of rivers, streams, canals, lakes, and impoundments. Should such preventive measures fail, immediately take such other action as necessary to effectively prevent erosion and siltation. The Engineer may direct the Contractor to perform, during such suspensions of operations, any other erosion control work deemed necessary.

## **2.3 TRAFFIC CONTROL**

The Contractor shall maintain traffic within the limits of the project for the duration of the construction period, including any temporary suspensions of the work. Construct and maintain detours. Provide facilities for access to residences, businesses, etc., along the project. Furnish, install, and maintain traffic control and safety devices during construction. Furnish and install work zone pavement markings for maintenance of traffic in construction areas. Provide any other special requirements for safe and expeditious movement of traffic specified on the plans. Maintenance of Traffic includes all facilities, devices and operations as required for safety and convenience of the public within the work zone.

Do not maintain traffic over those portions of the project where no work is to be accomplished or where construction operations will not affect existing roads. Do not obstruct or create a hazard to any traffic during the performance of the work and repair any damage to existing pavement open to traffic.

### **(1) Materials**

Meet the following requirements of latest FDOT Standard Specifications Sections:

- Raised Retro-reflective Pavement Markers - Section 990
- Bituminous Adhesive - Section 970
- Work Zone Pavement Markings- Section 971-1 Section 971-19
- Paint - Section 971
- Glass Spheres - Section 971
- Preformed Pavement Stripes and Markings Section 971-18

#### **2.3.1.1 Temporary Traffic Control Devices**

Use only the materials meeting the requirements of latest FDOT Standard Specifications Section 990, Roadway and Traffic Design Standards and MUTCD. All temporary traffic control devices shall be on the FDOT's approved product list.

#### **2.3.1.2 Detours**

Provide all materials for the construction and maintenance of all detours.

#### **2.3.1.3 Commercial Materials for Driveway Maintenance**

Provide materials of the type used for base, including recycled asphalt pavement material, and having stability with drainage properties of a firm surface under wet conditions.

### **2.3.2 Specific Requirements**

#### **2.3.2.1 Beginning Date of Contractor's Responsibility**

Maintain traffic starting the day work begins on the project or the first day contract time is charged, whichever is earlier.



### **2.3.2.2 Worksite Traffic Supervisor**

Provide a Worksite Traffic Supervisor in accordance with latest FDOT Standard Specifications Section 105. Ensure that the Worksite Traffic Supervisor is available on a 24-hour per day basis, participates in all changes to traffic control and reviews the project on a day-today basis.

Ensure that the Worksite Traffic Supervisor is present to direct the initial setup of the traffic control plan and any changes. Provide the Worksite Traffic Supervisor with all equipment and materials needed to set up and maintain traffic control and handle traffic related situations.

Ensure that the Worksite Traffic Supervisor immediately corrects all safety deficiencies. Do not allow minor deficiencies that are not immediate safety hazards to remain uncorrected for more than 24 hours.

Ensure that the Worksite Traffic Supervisor is available within 45 minutes after notification of an emergency and is prepared to positively respond to repair the work zone traffic control or to provide alternate traffic arrangements.

The Department may disqualify and remove from the project a Worksite Traffic Supervisor that fails to comply with the provisions of this Sub article. The Department may temporarily suspend all activities, except traffic and erosion control and such other activities that are necessary for project maintenance and safety, for failure to comply with these provisions. Ensure that the Worksite Traffic Supervisor performs a drive-through inspection and observes traffic flow as soon as the work zone is activated and in each subsequent phase of work as they are opened to traffic. Provide the Engineer a report, listing any deficiencies and proposed corrective measures.

Ensure that the Worksite Traffic Supervisor conducts within the limits of the project, daily daytime, and weekly night inspections within the limits of the project for projects with predominate daytime work activities and daily nighttime and weekly daytime inspections for projects with predominate nighttime work, of all traffic control devices, traffic flow, pedestrian, bicyclist, and business accommodations.

Advise the project personnel of the schedule of these inspections and give them the opportunity to join in the inspection as is deemed necessary. Submit a comprehensive weekly report to the Engineer and include condition of all traffic control devices (including pavement markings) being used. The inspection report will also include assurances that pedestrians are accommodated with a safe travel path around work sites and safely separated from mainline traffic, that existing or detoured bicyclist paths are being maintained satisfactorily throughout the project limits, and that existing businesses in work areas are being provided with adequate entrances for vehicular and pedestrian traffic during business hours. The Worksite Traffic Supervisor will sign the report and certify that all of the above issues are being handled in accordance with the Contract Documents. If deficiencies are noted, the Worksite Traffic Supervisor is to note such deficiencies and include the proposed corrective actions.



### **2.3.3 Alternative Traffic Control Plan**

The Contractor may propose an alternative Traffic Control Plan (TCP) to the plan presented in the Contract Documents. Have a Specialty Engineer sign and seal the alternative plan. Indicate in the plan a TCP for each phase of activities. Take responsibility for identifying and assessing any potential impacts to a utility that may be caused by the alternate TCP proposed by the Contractor and notify the City in writing of any such potential impacts to utilities.

Engineer's approval of the alternate TCP does not relieve the Contractor of sole responsibility for all utility impacts, costs, delays or damages, whether direct or indirect, resulting from Contractor initiated changes in the design or construction activities from those in the original Contract Specifications, design plans (including traffic control plans) or other Contract Documents and which effect a change in utility work different from that shown in the utility plans, joint project agreements or utility relocation schedules.

The Department reserves the right to reject any Alternative Traffic Control Plan. Obtain the Engineer's written approval before beginning work using an alternate TCP. The Engineer's written approval is required for all modifications to the TCP. The Engineer will only allow changes to the TCP in an emergency without the proper documentation.

### **2.3.4 Traffic Control**

#### **2.3.4.1 Standards**

Latest FDOT Roadway and Traffic Design Standards are the minimum standards for the use in the development of all traffic control plans. The latest MUTCD Part VI is the minimum national standard for traffic control for highway construction, maintenance, and utility operations. Follow the basic principles and minimum standards contained in these documents for the design, application, installation, maintenance, and removal of all traffic control devices, warning devices and barriers which are necessary to protect the public and workers from hazards within the project limits.

#### **2.3.4.2 Maintenance of Roadway Surfaces**

Maintain all lanes that are being used for the maintenance of traffic, including those on detours and temporary facilities, under all weather conditions. Keep the lanes reasonably free of dust, potholes, and rutting. Provide the lanes with the drainage facilities necessary to maintain a smooth riding surface under all weather conditions.

#### **2.3.4.3 Number of Traffic Lanes**

Maintain one lane of traffic in each direction. Maintain two lanes of traffic in each direction at existing four (or more) lane crossroads, where necessary to avoid undue traffic congestion. Construct each lane used for maintenance of traffic at least as wide as the traffic lanes existing in the area before commencement of construction. Do not allow traffic control and warning devices to encroach on lanes used for maintenance of traffic.

The Engineer may allow the Contractor to restrict traffic to one-way operation for short periods of time provided that the Contractor employs adequate means of traffic control and does not unreasonably delay traffic. When a construction activity requires restricting traffic to one-way operations, locate the flaggers within view of each other when possible.



When visual contact between flaggers is not possible, equip them with 2-way radios, official, or pilot vehicle(s), or use traffic signals.

#### **2.3.4.4 Crossings and Intersections**

Provide and maintain adequate accommodations for intersecting and crossing traffic. Do not block or unduly restrict any road or street crossing the project unless approved by the Engineer. Maintain all existing actuated or traffic responsive mode signal operations for main and side street movements for the duration of the Contract. Restore any loss of detection within 12 hours. Use only detection technology listed on the FDOT Approved Products List (APL) and approved by the Engineer to restore detection capabilities. Before beginning any construction, provide the Engineer with a plan for maintaining detection devices for each intersection and the name(s) and phone numbers of persons that can be contacted when signal operation malfunctions.

#### **2.3.4.5 Access for Residences and Businesses**

Provide continuous access to all residences and all places of business.

#### **2.3.4.6 Protection of the Work from Injury by Traffic**

Where traffic would be injurious to a base, surface course, or structure constructed as a part of the work, maintain all traffic outside the limits of such areas until the potential for injury no longer exists.

#### **2.3.4.7 Flaggers**

Provide trained flaggers in accordance with FDOT Standard Specifications Section 105.

#### **2.3.4.8 Use of Orange Vests/Garments**

All high-visibility safety apparel shall meet the requirements of the International Safety Equipment Association (ISEA) and the American National Standards Institute (ANSI) for High- Visibility Safety Apparel and labeled as ANSI 107-1999 or ANSI 107-2004. The apparel background (outer) material color shall be either fluorescent orange-red or fluorescent yellow-green as defined by standard. The retro-reflective material shall be either orange, yellow, white, silver, yellow-green, or a fluorescent version of these colors, and shall be visible at a minimum distance of 1,000 feet. Class 3 apparel may be substituted for Class 2 apparel. Replace apparel that is not visible at 1,000 feet. WORKERS: All workers within 15 feet of the edge of travel way shall wear ANSI/ISEA Class 2 apparel. Vehicle service responders such as tow truck drivers or other roadside vehicle service responders, media representatives when covering news events or similar actions within highway rights-of-way, military personnel when on foot, commercial drivers on foot within the right-of-way who are with disabled trucks or motor coaches, and volunteers working within the rights-of-way shall be required to wear safety apparel. Workers operating machinery or equipment in which loose clothing could become entangled during operation shall wear fitted high-visibility safety apparel. UTILITIES: When other industry apparel safety standards require utility workers to wear apparel that is inconsistent with FDOT requirements such as NFPA, OSHA, ANSI, etc., the other standards for apparel may prevail. FLAGGERS: For Daytime activities, Flaggers shall wear ANSI/ISEA Class 2 apparel. For nighttime activities, Flaggers shall wear ANSI/ISEA Class 3 apparel.



#### **2.3.4.9 Existing Pavement Markings**

Where a detour changes the lane use or where normal vehicle paths are altered during construction, remove all existing pavement markings that will conflict with the adjusted vehicle paths. Do not over paint. Remove existing pavement markings using a method that will not damage the surface texture of the pavement and which will eliminate the previous marking pattern regardless of weather and light conditions. Method approved for removal of pavement markings for surfaces not to be resurfaced with asphalt shall be water blasting or sand blasting. Remove all pavement markings that will conflict with the next phase of operation before opening to traffic.

#### **2.3.4.10 No Waiver of Liability**

Conduct operations in such a manner that no undue hazard results due to the requirements of this Article. The procedures and policies described herein in no way act as a waiver of any terms of the liability of the Contractor or his surety.

### **2.3.5 Detours**

#### **2.3.5.1 General**

Construct and maintain detour facilities wherever it becomes necessary to divert traffic from any existing roadway or bridge, or wherever construction operations block the flow of traffic.

#### **2.3.5.2 Construction**

Plans, construct, and maintain detours for the safe passage of traffic in all conditions of weather and provide for the detour with all facilities necessary to meet this requirement.

#### **2.3.5.3 Construction Methods**

Select and use construction methods and materials that provide a stable and safe detour facility. Construct the detour facility to have sufficient durability to remain in good condition, supplemented by maintenance, for the entire period that the detour is required.

#### **2.3.5.4 Removal of Detours**

Remove detours when they are no longer needed and before the Contract is completed. Take ownership of all materials from the detour and dispose of them, except for materials, which might be on loan from the Department with the stipulation that they are returned.

#### **2.3.5.5 Detours over Existing Roads and Streets**

When the Department specifies that traffic be detoured over roads or streets outside the project area, do not maintain such roads or streets. However, maintain all signs and other devices placed for the purpose of the detour.

#### **2.3.5.6 Traffic Control Officer**

The contractor shall provide at his/her expense, uniformed law enforcement officers, including marked law enforcement vehicles, to assist in controlling and directing traffic in the work zone when the following type of work is necessary on projects:

Traffic control in a signalized intersection when signals are not in use.



## **2.3.6 Driveway Maintenance**

### **2.3.6.1 General**

Ensure that each residence and or business has safe, stable, and reasonable access.

### **2.3.6.2 Construction Methods**

Place, level, manipulate, compact and maintain the material, to the extent appropriate for the intended use. As permanent driveway construction is accomplished at a particular location, the contractor may salvage and reuse previous placed material that are suitable for reuse on other driveways.

## **2.3.7 Temporary Traffic Control Devices**

### **2.3.7.1 Installation and Maintenance**

Install and maintain adequate traffic control devices, warning devices and barriers to protect the traveling public and workers, and to safeguard the work area. Erect the required traffic control devices, warning devices and barriers to prevent any hazardous conditions and in conjunction with any necessary traffic re-routing. Use only those devices that are included on the FDOT Approved Products List (APL). Specific requirements for Maintenance of Traffic devices, additional to the requirements of this Section, are contained in the 600 series of the FDOT Design Standards. Immediately remove, turn, or cover any devices or barriers that do not apply to existing conditions.

Notify the Engineer of any scheduled operation, which will affect traffic patterns or safety, sufficiently in advance of commencing such operation to permit his review of the plan for the proposed installation of traffic control devices, warning devices or barriers.

Ensure an employee is assigned the responsibility of maintaining the position and condition of all traffic control devices, warning devices and barriers throughout the duration of the Contract. Keep the Engineer advised at all times of the identification and means of contacting this employee on a 24-hour basis.

Keep traffic control devices, warning devices, safety devices and barriers in the correct position, properly directed, clearly visible and clean, at all times. Immediately repair, replace or clean damaged, defaced, or dirty devices or barriers.

### **2.3.7.2 Work Zone Signs**

Provide signs in accordance with the plans and the latest FDOT Design Standards. Meet the requirements of the latest FDOT Standard Specifications Section 700-2-5 to 700-5-5.

### **2.3.7.3 Business Signs**

Provide and place signs in accordance with the plans and FDOT Design Standards. Meet the sign background sheeting requirements of FDOT Standard Specifications Section 700. Furnish signs having a Type III reflectorized blue background with a 4 inches series B white legend and a white border. The maximum sign size is 24 by 36 inches. Use signs meeting the requirements of FDOT Design Standards Index 17355 unless specific business names signs are requested and approved by the Engineer. In those cases, show specific business names on each sign. Install logos provided by business owners and approved by the Engineer.



#### **2.3.7.4 High Intensity Flashing Lights**

Furnish Type B lights when requested for temporary traffic control device.

#### **2.3.7.5 Warning/Channelizing Devices**

Furnish warning and channelizing devices in accordance with the plans and latest FDOT Design Standards.

##### **2.3.7.5.1 Reflective Collars for Traffic Cones**

Use cone collars at night designed to properly fit the taper of the cone when installed. Place the upper 6 inches collar a uniform 3 1/2-inch distance from the top of the cone and the lower 4-inch collar a uniform 2-inch distance below the bottom of the upper 6-inch collar. Ensure that the collars are capable of being removed for temporary use or attached permanently to the cone in accordance with the manufacturer's recommendations. Provide white sheeting having a smooth outer surface and that essentially has the property of a retroreflector over its entire surface.

##### **2.3.7.5.2 Barrier Wall (Temporary)**

Furnish, install, maintain, remove, and relocate a temporary barrier wall in accordance with the plans. Temporary concrete barrier walls will be in accordance with Index No. 415 or identified on the QPL. Temporary water filled barrier wall will be in accordance with Index No. 416 or identified on the QPL.

##### **2.3.7.5.3 Temporary Vehicle Impact Attenuator (Redirect/Inertia)**

Furnish, install, maintain, and subsequently remove temporary vehicular impact attenuators in accordance with the details and notes shown in the plans, and the Design Standards. Maintain the attenuators until their authorized removal. Repair all attachment scars to permanent structures and pavements after attenuator removal. Make necessary repairs due to defective material, work, or Contractor operations at no cost to the Department. Restore attenuators damaged by the traveling public within 24 hours after notification as authorized by the Engineer.

##### **2.3.7.5.4 Guardrail (Temporary)**

Furnish guardrail (temporary) in accordance with the plans and FDOT Roadway and Traffic Design Standards. Meet the requirements of FDOT Standard Specifications Section 536.

##### **2.3.7.5.5 Advance Warning Arrow Panel**

Furnish advance warning panel in accordance with the plans and latest FDOT Roadway and Traffic Design Standards.

##### **2.3.7.5.6 Portable Changeable (Variable) Message Sign (PCMS)**

Furnish changeable (variable) message sign in accordance with the plans and latest FDOT Roadway and Traffic Design Standards.

The 7 feet by 10-foot PCMS as defined in FDOT Standard Specifications Section 9904.3 may be used as advanced warning maintenance of traffic devices and to supplement other traffic control devices used in work zones.



The 5 feet by 8-foot PCMS as defined in FDOT Standard Specifications Section 990-4.3 may be used as an alternate to either type A or type B arrow board on advanced warning vehicles or to supplement other traffic control devices used in a work zone.

A 5 foot by 8 foot PCNS may be used as a standalone maintenance of traffic control device only when used for incident management situation as defined in the MUTCD and latest FDOT Design Standards.

#### **2.3.7.5.7 Portable Regulatory Signs**

Provide portable regulatory signs in accordance with the plans and latest FDOT Roadway and Traffic Design Standards.

This specification establishes the physical display and operational requirements for solar powered portable regulatory signs. Ensure all portable regulatory signs meet the physical display and operational requirements as described in the Federal Highway Administration's MUTCD.

The portable regulatory sign must be activated only during active work activities and deactivated when no work is being performed. Ensure the sign can be activated and deactivated by a dial-up control system to allow operation of the sign from a remote location via cellular phone or standard telephone line. The sign must be protected by a security code, only use portable regulatory signs listed on the FDOT APL.

#### **2.3.7.5.8 Radar Speed Display Unit**

Furnish radar speed display unit in accordance with the plans and Design Standards.

All trailer mounted temporary traffic control devices such as arrow boards, portable changeable messages signs, portable regulatory signs and speed radar units shall be delineated with a channelizing device placed at each corner when in use and shall be moved outside the travel way and clear zone or be shielded by a barrier or crash cushion when not in use.

This Specification establishes the physical display and operational requirements for solar powered, Radar Speed Display Units used in active work zones to inform motorists of the posted speed and their actual speed.

Ensure the radar speed display is activated only during active work activities and deactivated when no work is being performed. Ensure the display unit can be activated and deactivated by a dial-up control system to allow operation of the display unit from a remote location via cellular phone or standard telephone line. The display unit must be protected by a security code.

Only use Radar Speed Display Units listed on the FDOT's QPL. Manufacturers providing the device described herein must provide a certified test report to the Department indicating the device meets these specification requirements.

#### **2.3.7.5.9 Temporary Traffic Control Signals**

Furnish, install, and operate temporary traffic control signals as indicated in the design plans. Temporary traffic control signals will consist of either portable or fixed traffic signals in accordance with the latest FDOT standards.



Provide certification that the portable traffic signals meet the requirements of the Design Standards and FDOT Standard Specifications Section 603-2. The Department may approve used signal equipment if it is in acceptable condition.

#### **2.3.7.5.10 Temporary Traffic Detection Technology**

Furnish, install, and operate Temporary Traffic Detection Technology listed on the FDOT APL and approved by the city to restore detection capability.

The City requires for permanent detection the installation of a Miovision system to be installed and the detection zones can be drawn or redrawn as the lanes are shifted during the construction.

#### **2.3.7.5.11 Trucks and Truck Mounted Impact Attenuators**

Furnish, install, and maintain only those attenuators that have been certified as meeting the requirements of National Cooperative Highway Research Program (NCHRP) 350 and have been properly maintained. Include the cost of trucks and truck mounted impact attenuators in MOT.

Use Truck Mounted Attenuators (TMA) when called for in the design plans. Limit the type of TMAs to those items listed on the FDOT APL. The truck mounted attenuator system designed and installed in accordance with the manufacturer's requirements.

Equip the TMA cartridge with lights and reflectors in compliance with applicable Florida motor vehicle laws, including turn signals, dual taillights, and brake lights. Ensure that lights are visible in both the raised and lowered positions if the unit is capable of being raised.

Ensure that the complete unit is painted Department of Transportation (DOT) yellow (Fed. Std. 595 b, No. 13538). Stripe the rear facing of the cartridge in the operating position with the alternating 6 inch white and 6-inch safety orange 45-degree striping to form an inverted "V" at the center of the unit and slope down and toward the outside of the unit, in both directions from the center. Ensure the bottom of the cartridge has the same pattern, covering the entire bottom, with 6 inch white and 6- i n c h safety orange stripes. Use Type III reflectorized sheeting for striping.

The trucks and truck mounted impact attenuators will not be paid for separately but will be included in the cost of Maintenance of Traffic. Payment includes all costs, including furnishing, maintenance and removal when no longer required, and all materials, labor, tools, equipment, and incidentals required for attenuator maintenance.

### **2.3.8 Work Zone Pavement Marking**

#### **2.3.8.1 Description**

Furnish and install Work Zone Pavement Markings for maintenance of traffic in construction areas and in close conformity with the lines and details shown on the plans. Measure the reflectivity of white and yellow stripes in accordance with Florida Method FM 5-541. Re-stripe anytime the reflectivity falls below the final values shown in FM 5-541. Use only pavement marking materials that do not contain any lead or chromium compounds. Manufacturers seeking product approval must furnish certified test reports



showing the Work Zone Pavement Marking material meets the requirements of this Section.

Centerlines, lane lines, edge lines, stop bars and turn arrows in the work zone shall be in accordance with the MUTCD, FDOT Standards and the following items:

- Install edge lines on paved shoulders.
- Place edge lines on all detours where vehicle path are altered from normal operation and where a lane is narrowed from its normal width for any reason.
- Apply Work Zone Pavement Markings, including arrows and messages as determined by the Engineer to be required for the safe operation of the facility before the end of the day if the street needs to be open to traffic. Channelizing devices may be used to direct traffic during the day before placing the Work Zone Pavement Markings.
- Work Zone Pavement Markings will be designated in the plans or by the Engineer as removable and non-removable.

Work Zone Raised Pavement Markers (WZRPMS) may be used in lieu of removable tape or paint. Removable Work Zone Pavement Markers consist of materials that can be taken up by hand. Non-removable Work Zone Pavement Markings consists of markings that are not classified as removable, Use of removable or non-removable work zone pavement markings are as follow:

APPLICATION	CATEGORY
<b>Finish Pavement*</b>	
All stripes representing final pavement markings	Non-Removable
All stripes in an area where the traffic pattern will be altered before project acceptance	Removable
<b>Intermediate Pavement Course</b>	
All stripes in pavement areas that will be covered with a subsequent course of pavement before altering of the traffic pattern within such area	Non-Removable
All stripes where the traffic pattern will be altered before placing of the subsequent paving course within such area.	Removable
<b>Existing Pavement</b>	
All stripes that will be removed or overlaid with new pavement before altering the traffic pattern within such area	Non-Removable
All stripes where the traffic pattern will be altered before removal or overlaying of such area.	Removable
*Place striping representing final markings in the permanent location unless accepted in writing by the Department.	



### **2.3.8.2 Preformed Removable Pavement Marking Film (Tape)**

#### **2.3.8.2.1 Application Requirements**

Apply removable Pavement Marking Film (Tape) with a mechanical applicator to provide pavement lines that are neat, accurate and uniform. Equip the mechanical applicator with a film cut-off device and with measuring devices that automatically and accumulatively measure the length of each line placed within an accuracy tolerance of  $\pm 2\%$ . Ensure pavement marking films (tape) adheres to the road surface. Tape may be placed by hand on short sections 500 feet or less if it is done in a neat accurate manner.

#### **2.3.8.2.2 Removability**

Provide preformed plastic pavement marking film capable of being removed from bituminous concrete and portland cement concrete pavement intact or in substantially large strips, either manually or by a mechanical roll-up device, at temperatures above 40°F, without the use of heat, solvents, grinding or blasting. Ensure that the manufacturer shows documented reports that the retro-reflective preformed plastic pavement marking film meets this requirement after being in place for a minimum of 90 days and under an average daily traffic count per lane of at least 9,000 vehicles per day.

#### **2.3.8.3 Work Zone Raised Pavement Markers (WZRPMS)**

Apply all markers in accordance with the MUTCD and latest FDOT Standards Plans Index No.600.

#### **2.3.8.4 Paint and Glass Beads**

Meet the requirements of FDOT Standard Specification Section 710.

**2.3.8.5 Preformed Non-Removable Pavement Marking Film (Tape)** Meet the requirements of FDOT Standard Specification Section 713.

### **2.3.9 Submittals**

#### **2.3.9.1 Submittal Instructions**

Prepare a certification of quantities for certified Maintenance of Traffic items for each project in the contract. Submit the certification of quantities to the City for approval.

The Contractor shall carry on the work in a manner that will cause the least interruption in traffic. Closing to through travel of more than two (2) consecutive blocks, including the cross street intersected will not be permitted without specific authorization of the Public Works Director or his representative. Where traffic must cross open trenches, the Contractor shall provide suitable bridges at street intersections and driveways and provide adequate ingress and egress to dwellings, business facilities, utilities, and services.

On completion of work, the contractor shall remove all debris, excess material, barricades, and temporary work leaving walkways and roads clear of obstructions. Traffic vehicles related to the construction shall be maintained within the project limits for the duration of the construction period.



## **2.4 CONTRACT CLOSEOUT**

### **2.4.1 Cleanup**

At the conclusion of the construction of any project the Contractor shall insure that all debris and other unsightly objects are removed and disposed of in a manner satisfactory to the City. The Contractor will restore to their original condition, as nearly as practicable, those portions of the site not designed for alteration.

### **2.4.2 Project Record Documents**

The Contractor shall layout the work at the location and to the lines and grades shown on the plans. Survey notes indicating the information and measurements used in establishing locations and grades shall be kept in notebooks made available to the Department and the owners, with the record drawings for the project.

The Contractor shall keep one record copy of all specifications, plans, addenda, modifications, shop drawings, and samples at the site in good order and annotated to show all changes made during the construction process. These shall be available to the Department for examination and shall be delivered to the Department upon completion of the work.



# STREETS

## SECTION 3



## **SECTION 3: STREETS (Revised 2024)**

### **3.1 GENERAL**

The purpose of this section is to specify the minimum design requirements, materials, and construction standards for street construction. Street construction includes design, clearing, grading, stabilizing, constructing base and surface coarse, paving asphalt, resurfacing, sidewalks, seeding, and mulching.

All streets, whether public or private, must be designed and constructed in the manner described herein and in accordance with the latest American Association of the State Highway Transportation Officials (AASHTO) Guide for Design of Pavement Structures or Latest Florida Department of Transportation (FDOT) Flexible Pavement Design Manual (FPDM).

Parking lots and drive aisles on private property are required to have an improved surface and shall meet those requirements that are deemed appropriate for the type of use involved.

#### **3.1.1 Design Requirements**

- (1) The latest edition of the AASHTO Guide for Pavement Structures or the 2023-24 FDOT Flexible Pavement Design Manual shall be used as guidelines in the design of all streets.
- (2) No pavement cuts are allowed on any publicly maintained streets that have been surfaced or resurfaced within the previous ten (10) years. Resurfacing is defined as a coarse of asphalt at least 1 (one) inch thick applied to a full lane width at least 50 feet in length.
- (3) Reinforced concrete pipe (RCP) Class III or Polyurethane Plastic Pipes (PPP) Gray Pipe shall be used under all streets that are located in public right-of-way. Alternative pipe materials must be approved by the City Engineer or his representative.
- (4) All development of streets must comply with existing city code requirements.

#### **3.1.2 Right-of-Way Width**

##### **(1) Definitions**

(a)Local: A route providing access of relatively low average traffic volume, short average trip length, or minimal through-traffic movements, and high land access for abutting property.

(b)Collector: A route providing access of relatively moderate average traffic volume, moderately average trip length, and moderately average speed. These routes collect and distribute traffic between local or arterial roads.

(c)Arterial: A route providing access which is relatively continuous and of relatively high traffic volume, long average trip length, and high mobility importance.



- (2) Required Right-of-Way Width for Roadway Classification shall be the following:

Streets	RW Width
Local	50 ft (close drainage system)
Local	60 ft (open drainage system)
Collector	80 ft to 100 ft
Arterial	100 ft to 130 ft

### 3.1.3 Lane Width

Minimum travel lane widths shall be ten (10) feet. A greater lane width may be required by the City Engineer or his representative for special lanes. Collectors and arterial lanes shall be a minimum of twelve (12) feet. Paved shoulders shall be provided as follows:

All collector and arterial roadway sections shall have a minimum of 4 ft paved shoulder adjacent to the travel lane and the curb, where bicycle paths are not already provided. Two (2) foot paved shoulders should be provided if bicycle paths are provided.

Travel lane width does not include curbs where closed drainage is constructed.

### 3.1.4 Pavement Cross Section (Thickness)

Streets	Subbase	Base	Asphalt
Local	8"	8"	1.5"
Collector	10"	10"	2"
Arterial	10"	12"	3"

- (1) The base shall extend one (1) foot beyond the surface course or back of curbs.
- (2) Base thickness for curbs shall be 8" local, 10" collector and 12" arterials.
- (3) The subgrade shall extend two (2) feet beyond the surface course.
- (4) Streets constructed for use by commercial shall meet collector standard.
- (5) Streets constructed for use by industrial shall meet arterial road standards.
- (6) Pavement Specifications:
  - (a) Subgrade (FDOT Type B Stabilized)
    - Density – 98 percent of maximum (AASHTO T – 180 Method D)
    - Lime rock Bearing Ratio (LBR) – (40) Minimum
  - (b) Base (Ocala or Miami Formation Lime rock or Cemented Coquina.



- Density – 98 percent of maximum (AASHTO T- 180 Method D)
- Lime rock – LBR 100 Minimum

(c) Surface Coarse FDOT Type SP 9.5 or SP 12.5 (or approved by the City Engineer)  
Marshall Stability – 1500 minimum

Where Asphalt Concrete is specified in the Plans, and approved by the City Engineer, Type II Asphalt Concrete may be selected as an alternate for the final surface when no friction course is specified, and as the final layer of structural course prior to the friction course.

### **3.1.5 Pavement Radii**

The street radii of the edge of pavement at intersecting streets shall be minimum of 35 feet. For collector and arterials streets the radii shall be 40 feet or as directed by the City Engineer.

### **3.1.6 Traffic Design**

Pavement marking, traffic signals and signs, design speed medians, intersection, street illumination, street layout and other roadway design features shall be designed and reviewed in accordance with AASHTO's *A Policy of Geometric Design of Highways and Streets* latest edition and its supplements, *FDOT Manual of Uniform Minimum Standards for Design, Construction, and Maintenance for Streets and Highways*, (20023-24) and its supplements, and U.S. Department of Transportation, Federal Highway Administration *Manual on Uniform Traffic Control Devices (MUTCD)*, (2009) and its supplements, and existing standard engineering practices. All aspects of the design shall be designed considering the City's 2045 Comprehensive Plan, effect on the local community, existing and future traffic volumes, school zones, major trip generators, and the safety and welfare of the general public.

### **3.1.7 Maintenance of Traffic During Construction**

For construction on existing streets, there shall be a section of the plans devoted to the maintenance of traffic during construction. See specifications in this manual for MOT. MOT plans shall be signed and sealed by Florida licensed Professional Engineer when work is proposed on collector or arterial roadways.

## **3.2 MATERIALS**

The scope of this Division of the Specifications includes the furnishing, construction, and testing of street pavements. Street pavement construction may include clearing, grubbing, excavation, grading, stabilizing, constructing base of crushed coquina or lime rock, asphalt concrete surfacing, applying leveling course, resurfacing, sidewalks, seeding and mulching, and incidental construction as required.

### **3.2.1 Stabilizing Materials**

The stabilizing material must be added to meet the requirements of these specifications which shall consist of the following:



Local Materials – High-bearing-value soils or sand-clay materials passing the 40mesh sieve, having a liquid limit not greater than 30 and having a plasticity index not greater than 10.

Commercial Materials – Commercial lime rock, lime rock overburden or crushed shell meeting the requirements of 2023-24 FDOT Standard Specifications.

Recyclable Materials – Crushed concrete, roof tiles and asphalt coated base or reclaimed pavement may be used for stabilizing the soil. No materials that deteriorate over time, cause excessive deformations, contain hazardous substances, contaminates, or do not improve the bearing capacity of the stabilized material may be used. At least 97% by weight of the total material shall pass a 3 ½ inch sieve. Material having a plasticity index greater than ten (10) or a liquid limit greater than forty (40) shall not be used as a stabilizer. Any further testing shall be in full compliance with Section 914-4 of 2023-24 FDOT Standard Specifications.

### **3.2.2 Lime rock Base Course**

Lime rock of either Miami or Ocala formation material may be used but only one formation on any one contract. The minimum percentage of carbonates of calcium and magnesium in the lime rock material shall be 70 percentage if water-sensitive clay shall be 3 percent. Liquid limit shall not exceed 35 percent and the material shall be non-plastic.

Lime rock material shall not contain cherty or other extremely hard pieces, or lumps, balls or pockets of sand or clay size material in sufficient quantity as to be detrimental to the proper bonding, finishing, or strength of the lime rock base.

At least 97 percent (by weight) of the material shall pass a 3½-inch sieve and the material shall be graded uniformly down to dust. The fine material shall consist entirely of dust of fracture. All crushing or breaking up, which might be necessary in order to meet such size requirements, shall be done before the material is placed on the road.

Lime rock material shall have a Lime base Bearing Ratio (LBR) value of not less than 100. LBR requirements will be tested in accordance with FDOT Florida Method FM 5-515 and sampled in accordance with FM-504 for each material change and/or days production.

Prime coat shall conform to the requirements of this manual.

### **3.2.3 Cemented Coquina Base Course**

Cemented Coquina shall be defined as material from the Anastasis Formation composed essentially of whole or broken shells, coral, and skeletal remains of other marine invertebrates which have been cemented together by carbonated, silicates, or other natural cementing agents.

The minimum percentage of carbonates of calcium and magnesium in the material shall be 50. Carbonates shall be sampled in accordance with FDOT Florida Method (FM) 5-514 for each material change and/or days production. The material shall not contain loose shell or silica sand in sufficient quantity to prevent proper bonding. Material which shows a significant tendency to slake or undergo chemical or physical change or



exposure to weather, will not be acceptable. At least 97 percent of the material shall pass a 3 ½-inch sieve. No more than 20 percent by dry weight of the material shall pass the 200 sieve by washing. The portion of the material passing the no. 40 sieve shall be non-plastic. The material shall have an LBR value of not less than 100. LBR requirements will be tested in accordance with FDOT Florida Method (M+FM) 5-515 and sampled in accordance with FM-504 for each material change and/or days production.

Prime coat shall conform to the requirements covered in prime coat of this manual.

Alternative base material shall be approved on a case by case basis by the City Engineer or his representative.

### 3.2.4 Pavement Surfacing

Prime Coat shall be Emulsified Asphalt Grades SS-1 or CSS-1, SS-1H, or CSS-1H diluted in equal proportion with water. Where the above materials for use as a prime coat are to be diluted, certify that the dilution was done in accordance with 2023-24 FDOT Standard Specifications Section 300 for each load of material used.

Tack Coat shall be Emulsified Asphalt, Grades RS, SS-1, or SS-1H meeting the requirements of AASHTO M140 (for anionic) and M208 (for cationic) except that the viscosity requirements shall not apply.

Use a rate of application as defined in latest FDOT Spec Table 334-5 which is shown below. Control application rate within plus or minus 0.01 gallon per square yard of the target application rate. The target application rate may be adjusted by the City Engineer to meet specific field conditions. Determine the rate of application as needed to control the operation. When using PG 52-28, multiply the target rate of application by 0.6 factor.

FDOT Table 334-5 – Tack Coat Application Rates		
Asphalt Mixture Type	Underlying Pavement Surface	Target Tack Rate (gal/yd <sup>2</sup> )
Base Course, Structural Course, Dense Graded Friction Course	Newly Constructed Asphalt Layers	0.05 minimum
	Milled Surface or Oxidized and Cracked Pavement	0.07
	Concrete Pavement	0.09
Open Graded Friction Course	Newly Constructed Asphalt Layers	0.06
	Milled Surface	0.08

### 3.2.5 Asphalt Concrete

Asphalt Concrete used on all streets shall conform to the 2023-24 FDOT Standard Specification Section 334 for Local Agency Program (LAP). FDOT provides a Local Agency Program (LAP) specification for asphalt concrete per Section 334 LAP. The contractor shall submit an asphalt design mix that shall conform to the above specifications prior to placement.



**General:** Construct asphalt concrete pavement based on the type of work specified in the Contract. Asphalt work shall meet applicable requirements for plants, equipment, and construction requirements as defined below.

Asphalt Work Mix Categories: Construction shall be of asphalt concrete pavement which will fall into one of the following work sequences.

Asphalt Work Category 1: Includes the construction of bike lanes, pathways and miscellaneous asphalt areas.

Asphalt Work Category 2: Includes the construction of new turn lanes, paved shoulders and other non-mainline travel pavement lanes.

Asphalt Work Category 3: Includes the construction of new mainline travel pavement lanes, milling operation and resurfacing.

Mix Types: Use the appropriate mix type as shown below in the FDOT Tables 334-1

FDOT Standard Specification – Table 334-1 Mix Types			
Asphalt Work Category	Mix Types	Traffic Level	ESALs (millions)
1	Type SP-9.5	A	<0.3
2	Structural Mixes: Types SP-9.5 or SP-12.5 Friction Mixes: Types FC-9.5 or FC-12.5	B	0.3 to <3
3	Structural Mixes: Types SP-9.5 or SP-12.5 Friction Mixes: Types FC-9.5 or FC-12.5	C	≥3

Additional Requirements: The following requirements also apply to asphalt concrete mixtures:

1. When construction includes the paving of adjacent shoulders (less than or equal to 5 feet wide), the layer of thickness for the upper pavement layer and shoulder shall be the same and paved in a single pass, unless otherwise noted in the contract plans.
2. On variable thickness of overbuild layers, the minimum and maximum allowable thickness of asphalt Type II shall be as specified below:

Type SP-9.5..... 3/8 to 2 inches  
Type SP-12.5..... ½ to 3 inches  
Type SP-19.0..... 1-1/2 to 4 inches



Asphalt Cement shall be asphalt cement viscosity Grade AC-20 conforming to the requirements of Section 916-1 of the 2023-24 FDOT Standard Specifications.

Mineral Filler shall consist, in general, of lime rock dust, cement, slag dust, hydrated lime, or any other approved inert mineral matter conforming to the requirements of Section 917 of the 2023-24 FDOT Standard Specifications.

Coarse Aggregates shall consist of gravel, stone or slag conforming to the requirements of Section 901 of the 2023-24 FDOT Standard Specifications.

Fine Aggregate shall consist of natural sand, stone screening, slag screenings or a combination thereof conforming to the requirements of Section 902-3 of the 2023-24 FDOT Standard Specifications as it applies to Type SP 9.5 and SP 12.5 asphalt concrete.

Gradation Design Ranges for bituminous concrete mixture shall conform to Table 3311 of the 2023-24 FDOT Standard Specifications as it applies to Type SP 9.5 and SP 12.5 of asphalt concrete.

Marshall Design Properties for bituminous concrete mixes shall conform to Table 331-2 of the 2023-24 FDOT Standard Specifications Section 334 LAP as it applies to Type SP 9.5 and Type SP 12.5 asphalt concrete.

Asphalt Concrete Type SP 9.5 and SP 12.5 mix design shall conform to the requirements of Section 334 LAP of 2023-24 FDOT Standard Specifications and mix formula shall include test data showing the material as produced will meet the specifications.

### **3.2.6 Curbing**

Curbing conforming to the standard plans or as ordered will be 3000 PSI concrete.

### **3.2.7 Sidewalks**

Sidewalk shall be 4" thick or 6" thick for driveways constructed with the width and depth as shown on the plans and shall have minimum concrete strength of 3000 PSI in 28 days.

### **3.2.8 Seed and Mulch**

Seed shall be permanent type grass seed and shall consist of a mixture of 20 pounds of 49 Bermuda seed and 80 pounds of Pensacola Bahia seed per acre of application and conforming to the requirements of Section 981-1 of the 2023-24 FDOT Standard Specifications.

Mulch shall be dry consisting of oat, rye, or wheat straw, or of pangola, peanut, coastal Bermuda, or Bahia grass hay. Only undeteriorated mulch, which can readily be cut into the soil, shall be used. Mulch material shall be free of noxious and undesirable weeds.

## **3.3 CONSTRUCTION**

### **3.3.1 Clearing and Grubbing**

Clearing and Grubbing shall be carried out in the following areas: road right-of way; lateral ditches; Retention/Detention ponds; embankments; where ditches or channels are



to be excavated; where structures will be constructed including culverts and pipelines; all other designated work areas as shown on the plans to be cleared and grubbed.

Grubbing consists of removing all trees, stumps, roots and other protruding objects, buildings, structures, appurtenances, pipes, existing flexible asphalt pavement, and other facilities necessary to prepare the area for the proposed construction to a depth of one (1) foot below the ground surface. Completely remove and dispose of all stumps within the road right-of-way. The surface shall then be plowed to a depth of not less than six (6) inches, and all stumps, roots, etc., thereby exposed shall be removed to a depth of at least one (1) foot. Remove roots and other debris from all excavated material to be used in the construction of roadway embankment or roadway base. Remove and dispose of all product and debris not required to be salvaged or not required to complete the construction.

Remove structures in such a way as to leave no obstructions to any proposed new structures or to any waterways. Also, perform certain miscellaneous work the inspector considers necessary for the complete preparation of the overall project site, as follows:

1. Plug any water wells that are encountered within the right-of-way that are to be abandoned.
2. Level the terrain outside the limits of construction for purposes of facilitating maintenance and other post-construction operations.
3. Cap any irrigation pipes encountered within the construction project area.

With the areas between the limits of construction and the outer limits of clearing and grubbing, all holes and other depressions shall be filled, all mounds and ridges cut down, and the area brought to uniform contour.

Protect and do not displace property obstructions which are to remain in place, such as buildings, sewers. Drains, water or gas pipes, conduits, poles, walls, bridges, etc.

Remove and dispose of the materials from existing structures. Remove the following: (1) those structures, or portions of structures, shown in the plans to be removed; (2) those structures, or portions of structures, found within the limits of the area to be cleared and grubbed, and directed by the inspector to be removed; (3) those structures, or portion of structures, which are necessary to remove in order to construct new structures; and (4) other appurtenances or obstructions which may be designated in the construction Contract Documents as to be included in an item of payment for the work.

Except as may be otherwise specified in the Contract Documents, the Contractor shall remove all buildings, structures, appurtenances, and other materials and shall be disposed of in accordance with the below. Dispose of timber, stumps, brush, roots, rubbish, and other objectionable material resulting from clearing and grubbing in areas and by methods meeting the applicable requirements of all Local, State and Federal regulations. No burning of materials will be allowed or permitted unless approved by the City Fire Marshall.

Handling, Transport and dispose of hazardous materials in accordance with all local, State and Federal requirements.



Accept responsibility for the collection, sampling, classification, packaging, labeling, accumulation time, storage, manifesting, transportation, treatment, and disposal of hazardous waste, both solid and liquid. Separate all solid and liquid waste and collect all liquids used at hygiene stations and handle as hazardous materials/waste.

Obtain written approval from the City Engineer for all hazardous materials/waste stabilization methods before implementation. Obtain an EPA/FDEP Hazardous Waste Identification Number (EPA/FDEP ID Number) before transporting and/or disposal of any hazardous materials/waste. List the Owner as the generator of all hazardous materials/waste. Submit the following for the Engineers' approval before transporting, treatment or disposal of any hazardous materials/waste:

- Name, address, and qualifications of the transporter,
- Name, address, and qualifications of the treatment facility,
- Proposed treatment and/or disposal of all Hazardous Materials/Waste.

Transport all hazardous materials/waste in accordance with applicable 40 Code of Federal Regulation (CFR) 263 Standards. Provide a copy of all completed Hazardous Materials/Waste manifest/bills of lading to the Engineer within 21 days of each shipment.

Furnish two copies of Certification of Compliance from the debris firm actually removing and disposing of the hazardous materials/waste stipulating, the hazardous materials/waste has been handled, transported and disposed of in accordance with this Specification. The Certification of Compliance shall be attested to by a person having legal authority to bind the debris company. Maintain all records required by this Specification and ensure these records are available upon request.

When the Contract Documents require furnishing and installing mailboxes, permit each owner to remove the existing mailbox. Work with the Local Postmaster to develop a method of temporary mail service for the period between removal and installation of the new mailboxes. Install the mailboxes in accordance with the AASHTO publication, "A Guide for Erecting Mailboxes on Highways".

### **3.3.2 Preparation of Subgrade**

On completion of clearing operations, topsoil in the roadway shall be removed and stored for use in filling and forming shoulders, embankments, and ditches. Soil shall not be removed from the project site except when directed by the City Engineer or representative.

Where unsuitable material occurs within the limits of the roadway, the Contractor shall remove such material and refill with suitable excavated material or authorized borrow. Where unsuitable material is removed, the surface of the excavated area shall be compacted by rolling with a sheepsfoot roller exerting a compression of at least 250 pounds per square inch on the tamper feet, for the full width of the roadbed (subgrade and shoulders). Such rolling shall be done before any refill is begun and shall be continued until the roller does not penetrate the surface more than one (1) inch.

When the plans contain the results of a soil survey, do not assume such data is a guarantee of the depth, extent, or character of material present. Where muck, rock, clay, or other material within the limits of the roadway is unsuitable in its original position,



excavate such material to the cross-sections shown in the plans or indicated by the inspector, and backfill with suitable material. Shape backfill material to the required cross-sections. Where the removal of plastic soils below the finished earthwork grade is required, meet a construction tolerance, from the lines shown in the plans as the removal limits, of  $\pm 0.2$  feet [in depth and  $\pm 6$  inches (each side) in width.

### **3.3.3 Stabilizing of Subgrade**

On completion of the grading operations, a stabilized roadbed shall be constructed. The roadbed shall be stabilized to a firm and unyielding subgrade having the required bearing value specified in the plans.

When the stabilizing is designated as Type B, the City Engineer based on the geotechnical soils report will determine compliance with the bearing value requirements by the Lime rock Bearing Ratio (LBR) Method. If approved by the Geotechnical Engineer for materials requiring an LBR value of 40, the City Engineer may omit Sections 6.0 and 6.1 of Florida Method of Test for Lime rock Bearing Ratio (FM 5-515) and perform an Unsoaked LBR Test.

The City Engineer or the Contractor may request to use this method. If the Unsoaked LBR Test results in a failing test, then the Geotechnical Engineer will perform a standard Soaked LBR Test.

The required bearing value shall be obtained either by constructing the roadbed of selected materials from the roadway, or by stabilizing the roadbed material by the addition and mixing -in of suitable stabilizing materials. Such work shall be constructed in accordance with these specifications and in accordance with the lines, grades and thickness shown on the plans.

The subgrade to be stabilized may be processed in one course, unless the equipment and methods being used do not provide the required uniformity, particle size limitation, compaction, and other desired results, in which case, the processing shall be done in more than one course. When additive stabilizing materials are required, they shall be spread uniformly over the area to be stabilized.

When the use of materials from an existing base is required as all, or a portion, of the stabilizing additives, the inspector will direct the location, placement, and distribution of such materials. Perform this work prior to the spreading of any additional commercial or local materials. Do not remove any section of the existing base until the need for it in maintaining traffic is fulfilled.

The mixing shall be done with rotary tillers, or other equipment meeting the approval of the inspector. The Contractor may mix the materials in a plant of an approved type suitable for this work. The area to be stabilized shall be thoroughly mixed throughout the entire depth and width of the stabilizing limits.

The mixing operations will be required regardless of whether or not the existing soil has the required bearing value without the addition of stabilizing materials. Regardless of the character or bearing value, all materials remaining after the mixing operations that will not pass a 3½ inch ring shall be removed or broken down to a size not larger than 3½ inches.



Bearing value samples will be obtained and tested at completion of satisfactory mixing of the stabilized area. For any area where the bearing value obtained is deficient from the value specified in the Contract Documents, additional stabilizing material shall be spread and mixed. This reprocessing shall be done for the full width of the roadway being stabilized and longitudinally for a linear distance of 50 feet beyond the limits of the area in which the bearing value is deficient. After mixing operations have been completed and the requirements of bearing value, uniformity and particle size have been satisfied, the stabilized area should be compacted to the specified density. The material shall be compacted at a moisture content permitting the specific compaction. IF the moisture content of the material is improper for attaining the specific density, either water shall be added, or the material shall be permitted to dry until the proper moisture content for the specified compaction is reached.

Within the entire limits of the width and depth of the areas to be stabilized, the minimum density acceptable at any location will be 98 percent of the maximum density as determined by Florida Methods (FM) 1-T 180 Method D. Attainment of the minimum density specified is not required within the upper six (6) inches of areas to be grassed under the contract. These areas shall be compacted to a reasonable firm condition as directed by the City Engineer. Use the following under tolerances from the specified bearing value, as based on tests performed on samples obtained after completing mixing operations:

Specified Bearing Value	Tolerance
LBR 40	5.0
LBR 35	4.0
LBR 30 (and under)	2.5

The following unsoaked bearing value requirement is based on tests performed on samples obtained after completing mixing operations.

Specified Bearing Value	Unsoaked Bearing Value Required	Tolerance
LBR 40	LBR 43	0.0

The completed stabilized subgrade shall be shaped to conform to the finish lines, grades, and cross section indicated on the plans.

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

After the subgrade has been completed as specified above, the Contractor shall maintain it free from ruts, depressions, and any damage resulting from the hauling or handling of



materials, equipment, tools, etc. It shall be the Contractor's responsibility to maintain the required density until the subsequent base or pavement is in place. Such responsibility shall include any reports, replacement, etc., of curb and gutter, sidewalk etc., which might become necessary in order to re-compact the subgrade in the event of under wash or other damage occurring to the previously compacted subgrade. Any such work required for re-compaction shall be at the Contractor's expense. Ditches and drains shall be constructed and maintained along the completed subgrade section.

#### **3.3.4 Lime rock Base Construction**

The work consists of the construction of base course composed of lime rock. It shall be constructed on the prepared subgrade, in accordance with these specifications and in conformity with the lines, grades and cross-sections shown on the plans. The spreading of the rock shall be done by methods approved by the inspector. All shaping shall be done utilizing a motor grader.

The lime rock shall be transported to the point where it is to be used, over rock previously placed, if practicable, and dumped on the end of the preceding spread. No hauling over the subgrade or dumping on the subgrade shall be permitted. If at any time the subgrade material should become mixed with the base course material, the Contractor shall without additional compensation, dig out 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. All segregated areas of fine or coarse rock shall be removed and replaced with properly graded rock.

When the specified compacted thickness of the base is greater than eight (8) inches, the base shall be constructed in two (2) courses. If, through field tests, the Contractor can demonstrate that the compaction equipment can achieve density for the full depth of a thicker lift, and if approved by the City Engineer, the base may be constructed in successive courses of not more than eight (8) inches compacted thickness. 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. At no time shall more than three (3) days of work on the first course be spread ahead of the second course.

For single-course base, after the spreading is completed, the entire surface shall be scarified and then shaped to produce the required grade and cross-section after compaction.

For double-course base, the first course shall be bladed, if necessary to secure a uniform surface, and brought to a surface cross-section approximately parallel to that of the finished base. Prior to the spreading of any material for the upper course, the density tests for the lower course shall have determined that the required compaction has been obtained.

After the spreading of the material for the second course is completed the surface of such course shall be scarified and shaped to produce the required grade and cross-section after compaction.

When the material does not have the proper moisture content to ensure the required density, wetting or drying will be required. When water is added, it shall be uniformly



mixed in by discing to the full depth of the course which is being compacted. Wetting or drying operations shall involve manipulation, as a unit, of the entire width and depth of the course, which is being compacted.

As soon as proper conditions of moisture are attained the material shall be compacted to an average density not less than 98 percent of the maximum density obtainable under FM 1-T 180, Method D. For double course base, average density shall be determined separately for each course. Lime rock base for shoulder pavement shall be compacted to a density not less than 95 percent of maximum density by FM 1-T 180, Method D.

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 complete prior to making the density determinations on the finished base.

At least three (3) density tests shall be made on each day of final compaction operations on each course, and the density test shall be made at more frequent intervals if deemed necessary by the inspector.

If cracks appear in the base surface, either before or after priming, which in the opinion of the inspector or by the City Engineer, which would impair the structural efficiency of the base course, the Contractor shall remove such cracks by scarifying, reshaping, and adding new base materials where necessary and recompacting. The finished surface of the base course shall be checked with a template cut to the required crown and with a 15-foot straightedge laid parallel to the center line of the road. All irregularities greater than a quarter ( $1/4$ ) inch shall be corrected by scarifying and removing or adding rock as required, after which the entire area shall be re-compacted as specified.

If, in the opinion of the inspector or City Engineer, the surface of the base has a glazed or cemented surface sufficient to prevent proper penetration of the prime coat, and after he/she determines that the condition of the base meets all requirements, he/she will direct that the surface be hard-planed with a blade grader and broomed immediately prior to the application of the prime coat. This hard planning shall be done in such a manner that only the glazed or cemented surface is removed, leaving a granular or porous condition that will allow free penetration of the prime material. The material planed from the base shall be removed from the base area. The hard- planning operations, when required, shall follow the surface-testing operations specified below.

The prime coat shall be applied only when the base meets the specified density required and the moisture content does not exceed 90 percent of the optimum moisture of the base material. At the time of priming, the base shall be firm, unyielding and in such a condition that no undue distortion will occur.

The Contractor will be responsible for assuring that the true crown and template are maintained, with no rutting or other distortion, and that the base meets all requirements at the time the surface course is applied.

Thickness of the base shall be measured at intervals of not more than 200 feet. Measurements shall be taken at various points on the cross-section through holes not less than three (3) inches in diameter.



Where the compacted base is deficient by more than one-half (1/2) inch from the thickness called for on the plans, the Contractor shall correct such areas by scarifying and adding rock. The base shall be scarified, and rock added for a distance of 100 feet in each direction from the edge of the deficient area. The affected areas shall then be brought to the required state of compaction and to the required thickness and crosssection.

### **3.3.5 Full Depth Reclamation (FDR) with Cement Base (Soil Cement)**

The work consists of the construction of a base course composed of cemented coquina. It shall be constructed on the prepared subgrade, in accordance with these specifications and in conformity with the lines, grades, and cross-section shown on the plans.

The spreading of the rock shall be done by methods approved by the inspector.

All shaping shall be done utilizing a motor grader.

**Layout:** The Contractor will be responsible for the string lining and lay out of the roadway prior to paving. Elevations of the existing road must be referenced at sufficient intervals to ensure the roadway elevation is not changed in any location after the final surface is placed.

Method for layout and line and elevation reference must be approved by the engineer prior to beginning work. It is imperative that roadway elevations remain unchanged except cross slope correction or as approved by the inspector or City Engineer

**Demo-pass:** The contractor will be responsible for determining the thickness of the existing pavement and if the thickness is greater than 3", the contractor shall be required to perform a demo pass of milling the existing asphalt to ensure the cement mix will have at least 2-3" thickness of pavement to reclaim with the base material.

**Weather and Seasonal limitations:** The base shall not be mixed or placed while the atmospheric temperature is below 40 F or when conditions indicate that the temperature may fall below 35 F within 24 hours, or when the weather is foggy or rainy, or when the soil or sub grade is frozen.

**Mix Design:** Prior to commencement of the FDR construction, the contractor shall obtain an adequate number of core samples to develop the mix design(s). Representative samples of the asphalt pavement material, underlying base material, and virgin material for testing to determine the proportions of cement needed to produce a mix design meeting the requirements of Table 332-1.

The optimum content shall result in the highest wet tensile strength while also having 70% retained tensile strength compared to the dry strength and additionally has a minimum 2500 pounds Marshall stability.

Cement shall be used at a minimum dosage rate of 1% and at a maximum dosage rate of 2.5% by dry weight of reclaimed material. Cement amounts greater than 3% will only be allowed if approved by the City Engineer. The mix design shall be signed and sealed by a professional engineer and submitted to the City Engineer prior to use for approval.



Table 332-1 Mix Design Criteria		
Test	Test Method Number	Criteria
Gradation of reclaimed material	AASHTO T 27-11	Report
Determination of optimum binder content		
Compaction effort at optimum fluids content. Marshall Compactor; 50 blows/side or Superpave Gyratory Compactor, 100 mm diameter specimens, 30 gyrations.  Density determination.	Asphalt Institute MS 14, Appendix F. ASTM D6926-10 AASHTO T 312-12 FM 1-T 166	Report
Marshall stability  Cure at 60°C to constant weight.  Test at 40°C.	ASTM D6927-06	2500 lbs. minimum stability
Resistance of compacted bituminous mixture to moisture induced damage. 55 to 75% vacuum saturation, water bath at 25°C for 23 hours, last hour in water bath at 40°C.	AASHTO T 283-07 (2011)	70% minimum retained tensile strength

**Widening:** When the existing base is to be widened, the Contractor shall excavate the shoulder from the edge of the existing pavement to at least 6 inches beyond the planned new width of the base prior to pulverization. All costs involved in collecting, hauling, and disposing of these materials shall be by the Contractor. The bottom of the trench shall be kept free of loose soil and vegetation.

Approved base material shall be placed in the excavation uniformly and without loss or contamination. The Contractor shall correct all areas of irregular grade or deficient thickness and shall remove and replace material contaminated with soil, organic material, or debris. After the final pass of the reclaimer, soil shall be drawn up against the widening material to close the excavation, and the shoulder shall be graded and compacted to produce a firm, even surface.

**Additional Material:** When additional material is to be added to correct cross slope deficiencies or change elevation as directed by the inspector, approved base material listed in FDOT Design Standards as General Use Optional Base Materials shall be placed on the roadway prior to final pass for pulverization and mixed uniformly with the existing material.



**Pulverization:** The existing pavement and base material shall be pulverized and blended to the depth required so the entire mass of material shall be uniformly graded to the following gradation:

SIEVE SIZE	PERCENT PASSING
2"	98 - 100
1-1/2"	95

Material gradation may vary due to local aggregates and conditions. Multiple passes of the reclaimer may be necessary to achieve the required gradation. The cement and water shall be introduced into the mix through the reclaimer uniformly and accurately and metered such that areas are of equal consistency and moisture content.

The reclaimed material and additives shall be combined in place to meet the requirements specified in such proportions that the reclaimed mixture is of acceptable composition and stability. Before the start and at the end of each day's work and at any time requested, the engineer must be permitted access to the mixing equipment to read the meter to verify the quantity of asphalt emulsion applied during the day's work.

Field adjustments shall be made as necessary to the recommended mix design under the guidance of a knowledgeable and competent technician or superintendent to obtain a satisfactory reclaimed mixture of consistent composition and stability throughout the Project. After the material has been processed, it shall be compacted to the lines, grades, and depth required. Water may be applied to ensure optimum moisture content at the time of mixing and compaction.

**Compaction:** Commence rolling with self-propelled rollers as required at the low side of the course, except leave 3 to 6 inches from any unsupported edge or edges unrolled initially to prevent distortion. Density readings shall be taken by Contractor's licensed nuclear gauge operator and witnessed by the Engineer/inspector.

Rollers shall move at a uniform speed that shall not exceed 8 km/hour (5 miles/hour). For static rollers, the drive drum normally shall be in the forward position or nearest to the paver. Vibratory rollers shall be operated at the speed, frequency and amplitude required to obtain the required density and prevent defects in the mat. Vibratory rollers shall not be allowed when road work is less than 200 feet from residential home.

The number, weight and type of rollers furnished shall be sufficient to obtain the required compaction of the reclaimed material. The field density of the compacted mixture shall be at least 94 percent of the maximum density of laboratory specimens prepared from samples of the base material taken from the material in place. The specimens shall be compacted in accordance with AASHTO T-180. The in-place field density shall be determined in accordance with ASTM D 2922.



Any pavement shoving or other unacceptable displacement shall be corrected. The cause of the displacement shall be determined, and corrective action taken immediately and before continuing rolling. Care shall be exercised in rolling the edges of the reclaimed mixture, so the line and grade of the edge are maintained.

At the end of each day's production, a transverse construction joint shall be formed by a header or by cutting back into the compacted material to form a true vertical face free of loose material.

The protection provided for construction joints shall permit the placing, spreading, and compacting of base material without injury to the work previously laid. Where it is necessary to operate or turn any equipment on the completed base course, sufficient protection and cover shall be provided to prevent damage to the finished surface.

**Finishing:** Finishing operations shall be completed and the base course shall conform to the required lines, grades, and cross section. If necessary, the surface shall be lightly scarified to eliminate any imprints made by the compacting or shaping equipment. The surface shall then be recompact to the required density. Correct all irregularities greater than 1/2" over ten feet to the satisfaction of the inspector.

**Protection and Curing:** After the base course has been finished as specified herein, it shall be protected against drying for a period of 2 to 3 days by the application of a prime coat as specified in FDOT Standard Specifications section 300 at a rate of not less than 0.15 gal/sy.

The curing method shall begin as soon as possible, but no later than 24 hours after the completion of finishing operations. The finished base course shall be kept moist continuously until the curing material is placed.

At the time prime coat is applied, the surface shall be dense, free of all loose and extraneous materials and shall contain sufficient moisture to prevent penetration of the bituminous material. Water shall be applied in sufficient quantity to fill the surface voids immediately before the bituminous curing material is applied.

To prevent equipment from marking or damaging the completed work surface, protect finished portions of base used by equipment. Do not allow traffic on the reclaimed base surface until it is assured the reclaimed base surface will not distort, shove or ravel under the anticipated vehicle loading.

The FDR surface shall be primed and allowed to be exposed for only two weeks before paving or when approved by the City Engineer to extend the exposed surface.

**Thickness:** The average thickness of the base constructed for one day shall be within 1/2-inch (12 mm) of the thickness required, except that the thickness of any one point may be within 3/4-inch (19 mm) of that required.

Where the average thickness shown by the measurements made in one day's construction is not within the tolerance given, the Engineer shall evaluate the area and determine if, in his/her opinion, it shall be reconstructed at the Contractor's expense, or the deficiency deducted from the total material in place.



**Sampling and Testing:**

<b><u>Control Testing for Full Depth Reclamation Field Sampling and Testing</u></b>			
<b>Type of Test</b>	<b>Method</b>	<b>Frequency</b>	<b>Size and Location</b>
RAP and Soil Cement Base Gradation	ASTM D-136	Each 3000 SY (not less than once per day)	20 lb. min sampled from hopper
Moisture Density Relationship of Soil Cement Mixtures	ASTM D-558	Each 1000 SY (not less than once per day)	33 lb. min sampled from pulverized base
Compressive Strength of Molded Soil Cement Cylinders	ASTM D-1633	Each 3000 SY (not less than once per day)	33 lb. min sampled from pulverized and mixed base
In-place Field Density	ASTM D-2922	Each 250 SY (not less than once per day)	Random locations after spreading and compacting

**Quality Control:** Perform the following quality control tests at the prescribed frequency within this section. City inspector shall approve randomly determine sample locations in accordance with ASTM D 3665-12 or equivalent. Correct all surface deficiencies unless otherwise approved by the City Inspector. Reclaimed material gradation: Determine the percent passing the following sieve sizes: 3 inches, 2 inches, No. 4, and No. 200. City shall review and approved the FDR mix design with the required gradation.

Obtain a sample at a frequency of one sample per 5,000 SY by the contractor for the quality testing. Meet the requirements of Table 332-2 per gradation standards. If the requirements of Table 332-2 are not met, adjust the pulverization operation so that the resultant material will meet specification requirements or to the satisfaction of the City Engineer.



Table 332-2 Gradation Requirements for Pulverized Material	
Sieve Size	Minimum Percent Passing
3 inches	100
2 inches	95
No. 200	0 to 20

Moisture/density relationship of reclaimed base: Establish a wet/dry density relationship for density specification compliance by obtaining a sample at a frequency of once per 5000 square yards for Modified Proctor (AASHTO T-180) determination. Determine the moisture content in accordance with AASHTO T 110-03 (2011), AASHTO T 265-12, or ASTM D 4643-08.

In-place field density: Perform nuclear density test per 1000 square yards. The dry field density (i.e., corrected gauge wet density) of the compacted mixture shall be at least 96.0 percent of the maximum laboratory dry density as determined by modified proctor. No individual density test shall be lower than 94.0 percent of the maximum laboratory dry density. If one density test is below 94.0 percent or two consecutive density tests are below 96.0 percent of the maximum laboratory dry density, cease production and resolve the issue to the satisfaction of the City Engineer before resuming production.

Marshall stability: Perform Marshall stability testing twice per day or once per day if less than 1500 square yards is reclaimed. Meet the requirements of Table 332-1. If the Marshall stability does not meet the requirements of Table 332-1, cease production, and resolve the issue to the satisfaction of the inspector before resuming production.

Retained tensile strength: Perform retained tensile strength testing twice per day or once per day if less than 1500 square yards is reclaimed. Meet the requirements of Table 332-1. If the retained tensile strength does not meet the requirements of Table 332-1, cease production, and resolve the issue to the satisfaction of the City Engineer before resuming production.

The cemented coquina shall be transported to the point where it is to be used, over cemented coquina previously placed, if practicable, and dumped on the end of the preceding spread. No hauling over the subgrade or dumping on the subgrade shall be permitted. If at any time the subgrade material should become mixed with the base course material, the Contractor shall, without additional compensation, dig out 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. All segregated areas of fine or coarse rock shall be removed and replaced with properly graded rock.

When the specified compacted thickness of the base is greater than eight (8) inches, the base shall be constructed in two (2) courses. 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. At no time shall more than three (3) days of work on the first course be spread ahead of the second course.



The finished surface of the base course shall be checked with a template cut to the required crown and with a 15-foot straightedge laid parallel to the center line of the road. All irregularities greater than one-quarter (1/4) inch shall be corrected, scarifying, and removing or adding rock as required, after which the entire area shall be re-compacted as specified herein before. In testing the surface, the measurements will not be taken in small holes caused by individual pieces of rock having been pulled out by the grader.

The inspector shall accept the base material from field inspecting the surface having a glazed or cemented surface sufficient to prevent proper penetration of the prime coat, and after the inspector has determined that the condition of the base meets all requirements, direct that the surface be hard planed with a blade grader and broomed immediately prior to the application of the prime coat. The hard planning shall be done in such a manner that only the glazed or cemented surface is removed, leaving a granular or porous condition that will allow free penetration of the prime material. The material planed from the base shall be removed from the base area. The hard-planning operations, when required, shall follow the surface-testing operations specified below.

The prime coat shall be applied only when the base meets the specified density, and the moisture content does not exceed 90 percent of the optimum moisture of the base material. At the time of priming, the base shall be firm, unyielding and in such a condition that no undue distortion will occur.

The Contractor will be responsible for assuring that the true crown and template are maintained, with no rutting or other distortion, and that the base meets all the requirements at the same time the surface course is applied. Thickness of the base shall be measured at intervals of not more than 200 feet. Measurements shall be taken at various points on the cross-section, through holes not less than three (3) inches in diameter.

Where compacted base is deficient by more than one-half (1/2) inch from the thickness called for in the plans, the Contractor shall correct such areas by scarifying and adding rock. The base shall be scarified, and rock added for a distance of 100 feet in each direction from the edge of the deficient area. The affected areas shall then be brought to the required state of compaction and to the required thickness and cross-section.

### **3.3.6 Prime Coat**

The work consists of the application of a bituminous prime coat on a previously prepared base in accordance with these specifications.

The surface to be primed shall be cleaned of all loose material, dust, dirt, caked clay, and other foreign material which might prevent proper bonding and the moisture content of the base shall not exceed 90 percent of the optimum moisture. The temperature of the prime material shall be between 100° and 150° F. The actual temperature shall be that which will insure uniform distribution. The material shall be applied by means of a pressure distributor. The amount to be applied will be dependent on the character of the surface and shall be sufficient to coat the surface thoroughly and uniformly, with no excess.



For Lime rock, lime rock Stabilized, and Local Rock Base, the rate of application shall be no less than 0.10 gallon per square yard. Sand-Clay, Shell, and Shell Stabilized Bases: The rate of application for these bases shall be no less than 0.15 gallon per square yard. If required, the base shall be lightly sprinkled with water and rolled with a pneumatic or rubber tire traffic roller, in advance of the application of the prime.

If warranted by traffic conditions, the application may be made on only one-half (1/2) the width of the bases at one time, in which case positive means shall be used to secure the correct amount of bituminous material at the joint.

If emulsified asphalt is used for prime coat, the primed base shall be uniformly covered by an application of sand-bituminous hot mix or screenings, at an appropriate rate of ten pounds per square yard. For the sand, meet the requirements as specified in 2023-24 FDOT Standard Specifications Section 902-2 or 902-6, and for the screenings, meet the requirements as specified in Section 902-5. The entire surface of the sand-bituminous hot mix or screenings cover material shall be rolled with a traffic roller as required to produce a reasonable dense mat. If material other than emulsified asphalt is used for prime coat, the primed base shall be covered by a light uniform application of cover material. If considered necessary for proper distribution of spread, the cover material shall be rolled with a traffic roller, for at least ten passes over the entire area. Do not apply prime and tack coats when the air temperature in the shade and away from artificial heat is less than 40°F at the location where the application is to be made or when weather conditions or the surface conditions are otherwise unfavorable.

### **3.3.7 Tack Coat**

The work consists of the application of a bituminous tack coat on a previously prepared base in accordance with these specifications.

In general, a tack coat will not be required on primed bases except in areas that have become excessively dirty and cannot be cleaned, or in areas where the prime has cured to the extent that it has lost all bonding effect. Generally, a tack coat will be required on hot bituminous base courses before placing the surface course.

The tack coat shall be applied with a pressure distributor except that, on small jobs, if approved by the inspector, application may be by other mechanical devices or by hand methods. The bituminous material shall be heated to a suitable temperature and shall be applied in a thin, uniform layer.

The rate of application shall be between 0.02 and 0.08 gallon per square yard. For tack coat applied on concrete pavement, which is to be surfaced, the rate of application may exceed the upper limit, if directed by the inspector.

The tack coat shall be applied sufficiently in advance of the laying of the bituminous mix to permit drying but shall not be applied so far in advance that it might lose its adhesiveness as a result as a result of being covered with dust or other foreign material. The tack coat surface shall be kept free from traffic until the subsequent layer of bituminous hot mix has been laid.



### **3.3.8 Asphalt Friction Course (FC)**

The work consists of the construction of an asphalt concrete friction course upon previously prepared base course in accordance with the requirements identified in 202324 FDOT Standard Specification Section 337 and per the latest FDOT Flexible Design Manual.

For all streets with 45 mph or less and specified for Friction Course (FC) application, the FC shall be Dense Graded Friction Course (DGFC) for FC 9.5 and FC -12.5.

- Type FC 9.5 shall be for lift thickness from 1' to 1.5" with Traffic C
- Type FC 12.5 shall be for lift thickness from 1.5" to 3.0" with Traffic C

#### **3.3.8.1 Weather Limitations**

The Plant operation shall not begin unless all weather conditions are suitable for the laying operations.

#### **3.3.8.2 Limitations of Laying Operations**

General: The mixture shall be spread only when the surface upon which it is to be laid has been previously prepared, is intact, firm, and properly cured and is dry. No mixture shall be spread that cannot be finished and compacted during daylight hours.

Wind: The mixture shall not be spread when the wind is blowing to such an extent that proper and adequate compaction cannot be maintained or when sand, dust, etc. are being deposited on the surface being paved, to the extent that the bond between layers will be diminished.

Ambient Temperature: Temperature shall be 50°F and rising. The mixture shall be transported in tight covered vehicles previously cleaned of all foreign material. Prior to the laying of the mixture, the surface of the base to be covered shall be cleaned of all loose and deleterious material by the use of power brooms or blowers, supplemented by hand brooming where necessary.

#### **3.3.8.3 Application of the Asphalt Paving Operation**

All asphalt mixtures, other than adjacent to curb and gutter or other true edges, shall be laid by the stringline method to assure the obtaining of an accurate, uniform alignment of the pavement edge. Control the unsupported pavement edge to ensure that it will not deviate more than  $\pm 1.5$  inches from the stringline.

The temperature of the mixture at the time of spreading shall be within 50°F of the temperature set by the inspector, which temperature shall be between 270° F and 350° F. The plant mix temperature shall not exceed 2023-24 FDOT Standard Specifications. Any load or portion of a load of asphalt mix on the roadway with a temperature outside of the specification range shall be rejected for use on the project. The inspector shall be immediately notified the contractor of the rejection.

Any mixture caught in transit by a sudden rain may be laid only at the Contractor's risk. Should such a mixture prove unsatisfactory, it shall be removed and replaced with a



satisfactory mixture at the Contractor's expense. In no case shall the mixture be laid while rain is falling or when there is water on the surface to be covered.

The depth of each layer shall be checked at frequent intervals, not to exceed 50 feet. Any deviation from the required thickness, in excess of the allowable tolerance, shall be immediately corrected. When making an adjustment, allow the paving machine to travel a minimum distance of 50 feet to stabilize before the second check is made to determine the effects of the adjustment.

In limited areas where the use of the spreader is impossible or impracticable, the mixture may be spread and finished by hand. Straight-edging and back-patching shall be done after initial compaction has been obtained and while the material is still hot.

Upon arrival, the mixture shall be dumped into the approved mechanical spreader and immediately spread and struck-off to the full width required and to such loose depth for each course that, when the work is completed, the specified thickness will be secured. Any excess amount of mixture shall be carried ahead of the screed. Hand raking shall be done behind the machine as required.

A shuttle buggy or material transfer vehicle shall be required on all arterial and major collector roadways or when directed by the City Engineer.

If necessary due to the traffic requirements, the mixture shall be laid in strips in such a manner as to provide for the passage of traffic. Where the road is closed to traffic, the mixture may be laid to the full width.

Before any rolling is started the surface shall be checked. Correct any irregularities, remove all drippings, fat sandy accumulations from the screed, and fat spots from any source, shall be removed and replaced with satisfactory material. No skin patching shall be done. When a depression is to be corrected while the mixture is hot, the surface shall be well scarified before the addition of fresh mixture. A pneumatic or rubber tire roller is required on all paving operations.

Monitor the mixed spread rate at the beginning of each day's production, and as needed to control the operations, at a minimum of once per 200 tons placed to ensure that the spread rate is within 5% of the target spread rate. When determining the spread rate, use an average of five truckloads of mix.

Upon completion of the finished pavement, no dumping of any material directly on the pavement will be permitted. Vehicular traffic shall not be permitted on any pavement that has not been set sufficiently to prevent rutting or other distortion.

#### **3.3.8.4 Control Testing Requirements**

The thickness shall be determined from the length of the core borings. The minimum frequency of cores samples shall be 3 per day. The maximum allowable deficiency from the specified thickness shall be as follows:

- (1) For pavement of specified thickness of 2½ inches or more – 1/2 inch.
- (2) For pavement of a specified thickness of less than 2 ½ inches – 1/4 inch.



### **3.3.8.5 When Deficiency is Seriously in Excess**

Where deficiency in thickness or requested trenching is:

- (1) In excess of 3/8 inch, for pavement of less than 2½ inches in specified thickness or,
- (2) In excess of 3/4 inch, for pavement of specified thickness of 2½ inches or more.

The Contractor shall correct deficiency on local and collector by milling and replacing the full thickness of asphalt for a length of 25 feet on either side of the deficient area or trenching width (when approved by the City Engineer). If the repair is adjacent to an intersection, no cold joint will be allowed in the intersection. The Contractor will receive no compensation for any pavement removed, nor for the work of removing such pavement repair. Arterials shall be milled and paved a minimum of 50 ft on either side plus the trench width.

### **3.3.8.6 When Deficiency is Not Seriously in Excess**

When the deficiency in the thickness of the pavement is over 1/4 inch but not more than 3/8 inch, for pavement of specified thickness less than 2½ inches: or when the deficiency in thickness is over 1/2 inch but not more than 3/4 inch, for pavement of specified thickness of 2½ inches or greater; the inspector will make a judgement determination on the repair. If acceptable by the inspector, the Contractor will be allowed to leave such pavement in place, but without compensation other than for the bituminous material contained therein.

The areas of pavement for which no square yard payment will be compensated shall be the product of the total repair distance, multiplied by the width of the lane which was laid at the particular paving segment in which deficient thickness was indicated.

### **3.3.8.7 Correcting Deficiency by Adding New Surface Material**

For any case of excess deficiency of the pavement the Contractor will be permitted, if approved by the inspector for each particular location, to correct the deficient thickness by adding new surface material and compacting to the same density as the adjacent surface. The area to be corrected and the thickness of new material added shall be as specified. All costs of the overlaying and compacting shall be borne by the Contractor.

### **3.3.8.8 Core Borings**

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 200 feet. The average thickness shall be determined from the measured thickness, and in accordance with the procedure and criteria specified herein.

If the Contractor believes that the number of cores taken is insufficient to properly indicate the thickness of the pavement, he may request additional borings at locations designated by him. The cost of these additional borings shall be deducted from any sums due the Contractor unless such borings indicate that the pavement within the questioned area is of specified thickness.



### **3.3.8.9 Criteria for Calculations**

- (1) Average thickness shall be calculated for the total length of the project.
- (2) When the thickness as measured by the cores is more than ½ inch greater than the specified thickness, it shall be considered in the calculation as the specified thickness plus ½ inch.
- (3) Areas of deficient-thickness pavement which are left in place with no compensation shall not be taken into account in the calculations.
- (4) Where areas of defected surface or deficient thickness are corrected by overlaying with additional material, the thickness used in the calculations shall be the specified thickness for the areas.

### **3.3.9 Leveling Course**

When a new surface course is to be constructed on an existing pavement (resurfacing) or an old base which is irregular, the existing surface shall be brought to proper grade and cross-section by the application of a leveling course consisting of Type II Asphalt Concrete.

Tack Coat as specified in this division will be required on the following surfaces:

- (1) On old pavements to be patched or leveled.
- (2) Between the leveling and surface courses.

#### **3.3.9.1 Patching Depressions**

Before any leveling course is spread, all depression in the existing surface more than one inch deep shall be filled by spot patching with leveling course mixture and then thoroughly compacted. The levelling course shall be done by the use of a paving machine.

#### **3.3.9.2 Rolling Patching and Leveling Courses**

Self-propelled pneumatic or rubber tire traffic rollers shall be used for the rolling of all patching and leveling courses. Where the initial leveling course is placed over broken concrete pavement, the pneumatic-tired roller shall weigh at least 15 tons.

Asphalt Concrete leveling course shall be compacted using a steel-wheeled roller to supplement the traffic rollers will be required. On other leveling courses, the use of steel wheeled roller will be at the Contractor option.

If leveling shall be placed in layers, it shall not exceed 100 pounds per square yard. No leveling shall be placed on cracked surface within a 24-hour period following a rain event.

Where the roadway is to be widened, the base shall be widened before the leveling course is constructed. In the event the leveling course is to be placed in two (2) or more layers, the first course of leveling shall be placed before the base widening, and the base widened before the remaining leveling course(s) are placed.



### **3.3.9.3 Patching Potholes**

Any pothole or depression deeper than three (3) inches shall be excavated to depth of six (6) inches with vertical sides and backfilled in two three (3) inch compacted layers with Type II asphalt concrete.

The leveling course shall be checked every 20-foot following straight edge.

### **3.3.10 Resurfacing Course**

The work shall consist of the construction of an asphalt paving surface course upon an existing underlying pavement, which has been brought to proper grade and cross-section by patching and leveling. Resurfacing shall be performed in conformance with the provisions noted for Friction Course and per latest FDOT specifications Section 337 Friction Coarse.

Transitions from existing pavement to resurfacing course shall be by transverse joint with a saw cut that exposes the full depth of the mat. The joint shall be trimmed; power broom cleaned, heated, lapped, and hot sealed. The surface course shall be checked with a 20-foot rolling straight-edge and any surface irregularity in excess of 3/4 inch shall be corrected except for drainage cross-swales and other areas as designated by the inspector.

### **3.3.11 Curbing**

The work consists of constructing curbing at the locations and in conformance with the details drawn on the plans or specified in accordance with FDOT, 2023-24 Standard Specifications for Road and Bridge Construction, Section 520.

### **3.3.12 Adjust Manholes and Catch Basins to Grade**

All existing manholes and catch basins which are to remain shall be raised or lowered so that tops will conform with new grades shown on the plans. All suitable materials removed from existing structures such as frames and covers may be reused if in good condition and satisfactory to the inspector. All such materials not suitable for reuse shall be removed from the work and replaced with new materials.

### **3.3.13 Adjust Gate Valve Boxes**

Existing gate valve boxes encountered in the work shall be excavated to the depth required to adjust the box to new grade and/or to properly align the box with the operating nut on the valve below.

### **3.3.14 Sidewalks**

The work consists of the grading, compaction, layout and finishing of concrete sidewalks. For paving operation along arterials and major collectors, the intersection ramps will be upgraded to meet the latest ADA standards for ramps and truncated domes.

### **3.3.15 Sodding**

The work consists of preparing the ground for the 12" strips of sod which will be hand placed to ensure the sod covers the ground area. During the first week after installation, new sod requires frequent, shallow watering. This means watering the new sod several times a day, ensuring that the top one inch of soil remains consistently moist to encourage the sod to establish roots in the soil. The sodding shall meet the FDOT specifications for performance turf Section 570.



### **3.3.16 Miscellaneous Asphalt Pavement**

Construct asphalt pavements in areas where vehicular traffic does not travel, such as pavement under guardrails, bicycle paths, median pavement, sidewalks, etc. Also, chemically treat the underlying soil, with a pre-emergent herbicide, approved for use under pavement, to prevent plant growth. For the pavement, use any plant-mixed bituminous mixture meeting the requirements of a mixed design verified by the City Engineer.

The inspector will accept the mixture on the basis of visual inspection and no further testing will be required. Compact the hot bituminous mixture with lightweight rollers or vibratory compactors as directed by the inspector. Hand tamps may be used in areas that are inaccessible to other compaction equipment.

### **3.3.17 Micro Surfacing**

Premium Micro Surfacing with 6% polymer mix design.

#### Description.

Construct a micro surfacing pavement with the type of mixture specified in the contract. Micro surfacing is a mixture of polymer-modified emulsified asphalt, mineral aggregate, mineral filler, water, and other additives, properly proportioned, mixed, and spread on a paved surface.

The micro mix shall be capable of being spread in variable thickness cross-sections (wedges, ruts, scratch courses, and surfaces) which, after curing and initial traffic consolidation, resists compaction throughout the entire design tolerance range of asphalt binder content and variable thickness to be encountered.

The end micro surfacing product shall maintain a skid resistant surface in variable thick sections throughout the service life of the micro surfacing.

The mix shall be a quick-traffic system that will be able to accept straight rolling traffic one hour after application.

#### General Requirements:

Provide asphalt emulsion as specified by the contract. Provide CSS-1HP for Conventional, and CSS-1EP for Premium. Emulsion shall meet the requirements of the tables below.

Sampling, Certification, and Verification: For the first load of emulsified asphalt produced for the project, the supplier shall submit a sample to the Agency's designated laboratory for testing before use. The cost of all listed items shall be included in the contract and covered by the Contractor. When applicable, a pretest number will then be assigned by the designated laboratory, which shall be furnished with all emulsified asphalt delivered to the project.

At any time during the application, the City Engineer or inspector may sample and test all subsequent loads of emulsified asphalt delivered to the project to verify and determine compliance with specification requirements. Where these tests identify material outside specification requirements, the City Engineer may require the supplier to cease shipment of that pre-tested product.



Further shipment of that pre-tested product to the Agency's projects will remain suspended until the cause of the problem is evaluated and corrected by the supplier to the satisfaction of the City Engineer.

Proper sampling and handling techniques are required, and the testing shall be completed within seven days of the sample being taken. Refer to AASHTO T 40 for emulsified asphalt sampling procedures.

Aggregate Material:

Use an aggregate consisting of 100% crushed stone. The aggregate shall be a crushed stone such as granite, slag, limestone, chat, or other high-quality aggregate, or a combination thereof and shall not be any stones from a Florida rock mine. To assure the material is 100% crushed, the parent aggregate will be larger than the largest stone in the gradation used. Use aggregate source(s) from an FDOT approved source.

Aggregate Quality Tests: In addition to the requirements of 2023-24 FDOT Standard Specification Sections 901 and 902, meet the minimum aggregate requirements shown on Table 335-7.

Gradation Requirements: When tested in accordance with AASHTO T27 and AASHTO T11, the target (mix design) aggregate gradation, including the mineral filler, shall be within the gradation range for a Type II or Type III mixture shown in Table 335-8.

Table 335-7 Quality Tests for Aggregate		
AASHTO Test No.	Aggregate Property	Specification Requirements
AASHTO T176	Sand Equivalent	65 Minimum
AASHTO T104	Soundness	15% Maximum using Na <sub>2</sub> SO <sub>4</sub> or 25% Maximum using MgSO <sub>4</sub>
AASHTO T96	Abrasion Resistance (1)	30% Maximum
AASHTO T278, T279	Polish Value	31 Minimum
(1) The abrasion test will be performed on the parent aggregate.		

The aggregate stockpile will be accepted based on five quality control gradation tests conducted in accordance with AASHTO T 2 and one sand equivalency test conducted in accordance with AASHTO T 176. If the average of the five gradation tests is within the stockpile tolerances shown



in Table 335-8 for all of the sieve sizes, and the one sand equivalent test meets the requirement shown in Table 335-7, then the stockpile is accepted.

If the average of the five gradation tests is not within the stockpile tolerances shown in Table 335-8 for any sieve size, remove the stockpiled material and replace it with new aggregate or blend other aggregate sources with the stockpiled material.

Aggregates used in blending must meet the quality tests shown in Table 335-7 before blending and must be blended in a manner to produce a consistent gradation and sand equivalent value. If the sand equivalent quality control test does not meet the criteria shown in Table 335-7, remove the stockpiled material and replace it with new aggregate.

If a new aggregate is obtained or blending of aggregates is performed resulting in an aggregate that is not represented by the mix design, submit a new mix design to the City Engineer for approval prior to production of the mix.

Costs for the test shall be borne by the Contractor.

Table 335-8 Aggregate Gradation Requirements			
Sieve Size	Type II Mix Design Range Percent Passing	Type III Mix Design Range Percent Passing	Stockpile Tolerance from Mix Design Percent Passing
3/8 inch	100	100	N/A
No. 4	90 – 100	70 – 95	± 6%
No. 8	65 – 90	45 – 70	± 5%
No. 16	45 – 70	30 – 50	± 5%
No. 30	30 – 50	20 – 35	± 4%
No. 50	18 – 30	12 – 25	± 4%
No. 100	10 – 21	7 – 18	± 3%
No. 200	5 – 15	5 – 12	± 3%

The Inspector may obtain stockpile samples at any time. If the average of five gradation tests conducted in accordance with AASHTO T 2 is not within the gradation tolerances shown in Table



335-8 for any sieve size, or if the sand equivalent value does not meet the requirements of Table 335-7, cease production until the problem is corrected to the satisfaction of the City Engineer.

All stockpiled aggregates shall be screened at the stockpile area prior to delivery to the paving machine to remove oversize material and non-desirable particles. The screened aggregate will be placed directly into the nurse truck or into the micro surfacing mixing machine, depending on whether continuous or truck mounted machines are used. Screened aggregate may not be placed on the ground prior to mixture laydown.

**Polymer Modifier and Polymer Modified Based Asphalt:** The base asphalt for the emulsion shall be SBS polymer modified at 6% prior to and not concurrent with the emulsification process and shall meet the requirements within these specifications.

**Mineral Filler:** Utilize Type I or I/II Portland cement, hydrated lime, limestone dust, fly ash or other approved filler, as listed in ASTM D242 for mineral filler. The owner will accept the mineral filler by visual inspection. The type and amount of mineral filler shall be determined by a laboratory mix design and will be considered as part of the aggregate gradation.

An increase or decrease of less than one percent of the mineral filler may be permitted during production if it is found to result in better consistency or set times. Any changes to the percentage of mineral filler must meet the requirements of Table 335-7 or as approved by the City Engineer.

**Water:** Utilize water that is potable and free of harmful soluble salts, reactive chemicals, or any other contaminants.

**Additives:** Additives may be added to the mixture or any of the component materials to provide control of quick-trafficking properties. The additives to be used shall be indicated on the mix design and be compatible with the other components of the mix. The additives shall be supplied by the asphalt emulsion manufacturer or approved by the laboratory as part of the mix design.

#### Mirco Surfacing Mix Design.

Before work begins, the Contractor shall submit a mixed design to the City Engineer. The mixed design must have been developed within the last year using the specific materials to be used on the project. Mix designs shall be developed by laboratories with experience in designing micro surfacing mixtures. When requested by the City Engineer, the mix design shall be verified by an independent laboratory not affiliated with the emulsion supplier or the contractor.

Table 335-9 Mix Design Testing Requirements		
Test	Method ISSA TB #(a)	Value
Wet Track Abrasion Loss, Maximum 1 hour, soak 6-day soak	TB 100	38 g/ft <sup>2</sup> 60 g/ft <sup>2</sup>



Lateral Displacement, Maximum	TB 147A or TB 147C	5%
Excess Asphalt by LWT (Maximum)	TB 109	50 g/ft <sup>2</sup>
System Compatibility, minimum grade	TB 144	11 points
Mixing Time, Seconds @ 77°F, minimum	TB 113	120
Set Time, 30 minutes, minimum	TB 139	12 kg-cm
Early Rolling Traffic Time, 60 minutes, minimum	TB 139	20 kg-cm
Water Resistance, 30 minutes	TB 102	No Discoloration
Wet Stripping Test, % Coating, minimum	TB 114	90
System Compatibility	TB 115	Pass
To be Conducted at Recommended Job Mix Formula		
Cantabro Mass Loss – % (b)	TX 245-F	2.0% Max
Indirect Tensile Stiffness Modulus – MPa (b)	EN 12697-26 Annex C	10,000 min
Bulk Specific Gravity	AASHTO T166	2.100-2.400
(a) Reference to ISSA TB means International Slurry Surfacing Association Technical Bulletin. (b) Samples to be prepared by ISSA TB 148 Marshall Compaction only (30 blows/side) and tested in dry condition at 25°C.		

Verification shall include confirmation of the mix design results for wet cohesion and 1hour wet track abrasion loss. Projects requiring rut filling, or multilayer application, shall also require lateral displacement confirmation.

Submit the proposed mix design with supporting test data indicating compliance with all mix design criteria. Allow the City Engineer a minimum of 10 days to either conditionally verify or reject the mix design.

Meet the requirements provided in Table 335-9. After the mix design has been approved, no substitutions to the mix design will be permitted, unless approved by the City Engineer.



The City Engineer will consider inadequate field performance of a mix as sufficient evidence that the properties of the mix related to the mix design have changed.

The project will be stopped until it is demonstrated that those properties, or issues, have been sufficiently addressed.

The mix design must clearly show the proportions of aggregate, emulsified asphalt, mineral filler, water, and additive usage based on the dry weight of the aggregate; allowable adjustments to mineral filler shall be identified in the mix design.

The mix design component material requirements are shown in Table 335-9 and 335-10.

Table 335-10 Mix Design Component Material Requirements	
Component Materials	Specification Requirements
Residual Asphalt	6.0 to 9.0% (by dry weight of aggregate)
Mineral Filler	0.5 to 3.0% (by dry weight of aggregate)
Polymer Modifier (solids based on asphalt weight content)	Minimum of 6.0% SBS
Additives	As needed
Water	As required to produce proper mix consistency

The materials (aggregates, emulsion, mineral filler, and additives) must be from the same source, grade and type used to develop the approved mix design. Any substitutions or alternate supplies must be preapproved by the Engineer.

Changes in the aggregate source or emulsion source require re-validating the mix design and the performance properties. Blending, co-mingling and otherwise combining materials from two or more sources, grades or types not noted in the approved Mix Design is strictly prohibited. Aggregate stockpiles and emulsion material should be located at or near the job site in sufficient quantity for the job or designated parts of the job.

Equipment.

General: Maintain all equipment, tools, and machines used in the performance of this work in satisfactory working condition, at all times to ensure a high-quality product.



**Mixing Equipment:** The paving mixture shall be blended by a self-propelled, positive, non-slipping aggregate delivery system (belt over chain) micro-surfacing mixing machine which shall be a continuous flow mixing unit able to accurately deliver and proportion the aggregate, polymer modified emulsion, mineral filler, field control additives and water to a revolving multi-blade, twin shafted mixer and discharge the mixed product on a continuous flow basis. The mixture shall be thoroughly blended so that no uncoated aggregate is visible upon discharge from the mixing unit. The machine shall be equipped with self-loading devices, which provide for the loading of all materials while continuing to lay the Premium micro surfacing, thereby minimizing construction joints. The machine shall be equipped with opposite side driving stations to optimize longitudinal alignment. The machine shall be equipped to allow the operator to have full hydrostatic control of the forward and reverse speed during the application of the micro-surfacing material. If truck mounted units are allowed, they shall be equipped with a positive, non-slipping aggregate delivery system (belt over chain) and have the capability of applying a minimum of 10 tons of aggregate without recharging the aggregate bin.

**Water Pressure System:** The mixing machine shall be equipped with a water pressure system and nozzle type spray bar to provide water spray ahead and outside the spreader box.

**Proportioning Device:** The machine shall be equipped with individual volume or mass controls or other gauging devices for measuring and proportioning each material (i.e., aggregate, mineral filler, emulsified asphalt, additives, and water) added to the mix. Each material control device shall be calibrated, properly marked, and positively interlocked. The aggregate feed to the mixer shall be equipped with a revolution counter or similar device so that the amount of asphalt emulsions, aggregate and mineral filler used may be determined at any time.

**Spreading Equipment:** Attached to the machine shall be a hydraulically adjustable type of spreader box with a positive screed adjustment for yield control. The box shall be attached to the mixer, equipped with ribbon flights mounted on an adjustable shaft to continually agitate and distribute the material throughout the box. The box will be equipped with curb bumpers and replaceable runners with a minimum of 5-ft long end runners. The box shall be equipped with a sufficient walkway to provide access to either side of the spreader box without walking through the freshly applied material. The box must be capable of laying mix to a width of 14 ft. The equipment shall provide sufficient turbulence to prevent the mix from setting in the box or causing excessive build-up or lumps. To prevent the loss of mixture from the box, the contractor shall attach flexible seals, front, and rear, in contact with the road. The full width application box shall be equipped with a secondary strike-off located approximately 2 to 3 ft behind the primary strike off to minimize transvers corrugations.

The secondary strike-off shall have elevation and width adjustments similar to the primary strike off. It shall have a pivot point where it can be tilted for texturing or raised completely off of the surface. The use of burlap drags or other drags necessary to obtain the desired surface texture shall require approval by the Agency. Drags having excessive build-up shall be replaced. Drags shall be kept in a completely flexible condition at all times.

**Rut-filling Equipment:** When required by the plans, Premium micro surfacing material may be used to fill ruts, utility cuts, depressions in the existing surface, etc. Mixtures shall meet the requirements of Type III. When rutting or deformation is less than 1/2 inch, a full width scratch course may be applied with the spreader box using a metal or stiff rubber strike-off. Ruts of 1/2 inch or greater in depth shall be filled independently with a rut-filling box, either five or six feet in



width. Ruts that are in excess of 1-1/2 inch in depth may require multiple applications with the rut-filling box to restore the cross-section.

When a rut box is used, emulsified asphalt content may be reduced by 0.5% of the mix design target. Any reduction of emulsified asphalt content must be within the tolerance of the job mix formulation listed in the mix design. Material placed with the rut-filling box shall have a 1/4-inch crown to allow for traffic consolidation. Before placing subsequent lifts, allow all rut-filling material to cure under traffic for at least 24 hours.

Emulsion Pump: The emulsion pump shall be heated, positive displacement-type pump.

Auxiliary Equipment: Provide suitable surface preparation equipment, traffic control equipment, hand tools, and any other support and safety equipment necessary to perform the work.

#### Calibration.

Calibrate each mixing unit to be used in the performance of the work in the presence of the Agency prior to the start of construction. Previous calibration documentation covering the exact materials to be used may be acceptable, provided that no more than 60 days have lapsed. Document the individual calibration of each material at various settings, which can be related to the machine metering devices. Do not utilize any mixing unit until the calibration has been completed and approved by the Agency.

Any component replacement affecting material proportioning requires that the machine be recalibrated. Once calibrated, the aggregate and emulsion flows shall not be changed without approval of the Agency. The water and additives may be adjusted in the field to control the mix properties to produce an acceptable mix.

#### Weather Limitations.

Premium Micro surfacing shall only be applied when both pavement and air temperatures are 50°F and rising. Do not apply when the weather is foggy or rainy or there is a forecast of temperatures below 32°F within 48 hours of placement. The mixture shall not be applied when weather conditions prevent opening to traffic within a reasonable amount of time, as determined by the Agency.

#### Surface Preparation.

General: Remove any thermoplastic striping materials and retro-reflective pavement markers in the areas to be micro surfaced. Provide temporary striping as necessary to comply with plan requirements. Immediately prior to applying the Premium micro surfacing, clear the surface of all loose material, silt spots, vegetation, and other material that will negatively affect the quality of the Premium micro surfacing, utilizing any standard cleaning method.

If water is used for cleaning, allow any unsealed cracks to dry thoroughly before applying micro surfacing. Protect manholes, valve boxes, drop inlets and other service entrances from the micro surfacing mixture by a suitable method. The Agency will approve the surface preparation prior to micro surfacing. No loose aggregate, either spilled from the lay-down machine or existing on the road, will be permitted.

Cracks: If the Work Order calls for crack filling prior to construction of the Premium micro surfacing treatment, pre-treat any cracks in the surface of the pavement with a crack filler meeting the material requirements of Section 305 prior to the application of the micro surfacing. Fill any cracks



with a width greater than 1/4 inch. Do not overfill the cracks. Crack filling material must cure for a minimum of 30 days prior to application of the micro surfacing.

**Rumble Strips:** Where shoulders are not to be treated, prevent material from being applied to or entering any rumble strip depressions. If necessary, remove any material that enters the depressions. When rumble strips are to be treated, place a scratch course to fill the depressions prior to placing the final surface course.

**Tack Coat:** Place a tack coat on all concrete or brick pavement prior to constructing a micro surfacing course. In general, the Agency will not require a tack coat on asphalt pavements except in areas that are extremely dry or raveled, as determined by the Agency. If required, the tack coat should be Premium micro surfacing emulsified asphalt. With 6% polymer. It may consist of one part emulsified asphalt to three parts water and should be applied with a standard distributor. The distributor shall be capable of applying the dilution evenly at a rate of 0.05-0.15 gallons per square yard.

#### Test Strip.

Construct a test strip for the Agency to evaluate. The test strip should be performed in similar conditions as those expected during actual application. The test strip shall be 1,000 feet in length at a location not associated with the project within reasonable proximity to the project staging area. The intention of the test strip is to assure adequate workmanship, aesthetics and that the cure time of the mixture is achievable when applied with the personnel, equipment and materials intended for use during execution of the project. Acceptable cure time is defined by the ability of the test strip to accept rolling traffic within one hour after placement. Full production may begin once the test strip has been accepted by the Agency.

If the Agency deems the test strip to be unacceptable, the Contractor shall make any necessary changes. Once the Agency is satisfied that the cause of the problem has been remedied, the Contractor may resubmit a new test strip for evaluation.

#### Application.

**General:** Pre-wet the surface by fogging water ahead of the spreader box. Adjust the rate of application of the fog spray to suit temperatures, surface texture, humidity, and dryness of the pavement.

The Premium micro surfacing shall be of the desired consistency upon leaving the mixer. The spreader trucks shall carry sufficient load of materials in the spreader box so to provide for a complete coverage of the roadway surface. Avoid overloading the spreader box. Do not allow lumping, balling, or unmixed aggregate in the micro surfacing mixture.

Do not leave streaks, such as those caused by oversized aggregate, in the finished surface. If excess streaking develops, stop production until the situation has been corrected. Excessive streaking is defined as more than four drag marks greater than 1/2 inch wide and 4 inches long, or 1 inch wide and 3 inches long, in any 30 square yard area. Do not permit transverse ripples or longitudinal streaks of 1/4 inch in depth or greater, when measured by placing a 10-foot straight edge over the surface.

**Rate of Application:** The average single application rate, as measured by the Contractor, shall be in accordance with Table 335-11, unless otherwise specified in the plans. Full width application rates must be maintained within plus or minus 2 pounds per square yard of the specified rate.



Application rates are based upon the weight of dry aggregate in the mixture. The maximum thickness of any single layer of micro surfacing at the edge of the pavement shall be 1/4 inch.

Joints: Prevent excessive buildup, uncovered areas, or unsightly appearance on longitudinal and transverse joints. Provide suitable width spreading equipment to produce a minimum number of longitudinal joints throughout the project. Place longitudinal joints on lane lines, where possible. Use half passes and odd width passes only when absolutely necessary.

Do not apply a half pass as the last pass of any area. Do not overlap longitudinal lane line joints by more than three inches. Do not construct joints having more than a 1/4-inch difference in elevation when measured by placing a 10-foot straight edge over the joint and measuring the elevation drop-off.

Construct longitudinal joints so that water is not held at the joint. Construct transverse joints at the beginning and end project limits so that the elevation difference between the micro surfacing and the adjacent pavement does not exceed 1/4 inch.

Mix Stability: Produce a Premium micro surfacing mixture that possesses sufficient stability so that premature breaking of the material in the spreader box does not occur. The mixture shall be homogeneous during and following mixing and spreading. The mixture shall be free of excess water or emulsified asphalt and free of segregation of the emulsified asphalt and aggregate fines from the coarser aggregate. Do not spray water directly into the spreader box while applying micro surfacing material under any circumstances.

Handwork: Utilize hand squeegees or lutes to provide complete and uniform coverage of micro surfaced areas that cannot be reached with the mixing machine. Lightly dampen the area to be hand worked prior to mix placement, if necessary. Care shall be exercised to leave no unsightly appearance from handwork. When performing handwork, provide the same type of finish as that applied by the spreader box.

Lines: Construct straight lines along curbs and shoulders. Do not permit runoff on these areas. Keep lines at intersections straight to provide a good appearance. If necessary, utilize a suitable material to mask off the end of streets to provide straight lines. Edge lines shall not vary by more than 2 inches horizontally.

Cleanup: Remove mixture from all areas such as manholes, gutters, drainage structures, rumble strips, and as otherwise specified by the inspector. On a daily basis, the remove of any debris resulting from the performance of the work.

Post Sweeping: If required by the Agency, broom the surface of any loose material within 48 hours after the completion of the micro surfacing. If directed by the inspector, perform this operation again approximately seven to ten days after completion of the application. Additionally, clean the surface, as necessary, prior to application of the final pavement markings.

#### Quality Control and Assurance.

General: Produce a mixture that will meet the mix design and the quality control (QC) tolerances specified in Table 335-12 shown below. Notify the City Engineer immediately if QC test results exceed the tolerances specified in Table 335-12 and stop mix production. Identify the cause of the deviation and determine the corrective action necessary to bring the mixture into compliance. Obtain the City Engineer's approval before resuming work.



The city reserves the right to verify, at the contractor's cost, QC test accuracy by an independent laboratory not heretofore associated with the project. If the City Engineer identifies a condition that causes an unsatisfactory micro surfacing treatment, immediately stop production work, and correct the defect at no additional cost.

The city may obtain one or more samples of the mixture for each day of production. Tests samples shall be collected and performed in accordance with AASHTO T308 and AASHTO T30 to determine the residual asphalt content and the gradation of the sample.

Evaporate all water from the sample prior to testing. Determine the deviation of the test results for each sample from the mix design target values. Compare the deviation from the mix design to the mixture control tolerance shown here.

Table 335-12 Micro Surfacing Quality Control Tolerances							
Aggregate Gradation Tolerances (±)							
Sieve Size	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200
Tolerance	6.0%	5.0%	5.0%	4.0%	4.0%	3.0%	3.0%
General Quality Control Tolerances (±)							
Parameter				Tolerance			
Asphalt Cement Content Single Test				0.5% from mix design			
Asphalt Cement Content Daily Average				0.2% from mix design			
Application Rate (as determined by 1,000 ft yield checks)				2 lb./yd <sup>2</sup>			
Sand Equivalent Test (ASTM D2419)				7% from mix design			

#### Contractor's Quality Control Plan.

Provide and follow a QC plan that will maintain QC for production and construction processes. Provide the City Engineer with a copy of the QC plan for review and approval before the preconstruction meeting. Include, at a minimum, the following items:

The source materials used on the project.

- Sampling and testing methods are used to determine compliance with material specifications.
- The equipment to be used on the project.
- Calibration method used to determine compliance with the mix design.
- Pavement cleaning and preparation procedure.
- Plan for protecting uncured mixture from damage by traffic.
- Procedure for monitoring initial acceptance requirements.
- An action plan demonstrating adjustments of the operation for adverse environmental conditions.



#### Minimum Sampling and Testing Frequency.

Fine Aggregate Gradation: Sample fine aggregate from the project stockpile and test for gradation and sand equivalency. Perform one test per 500 tons of fine aggregate.

At the discretion of the inspector, an alternative would allow certification of an entire stockpile. The stockpile will be accepted based on five quality control gradation tests conducted in accordance with AASHTO T 2 and five sand equivalency tests conducted in accordance with AASHTO T 176. If the average of the five gradation tests is within the stockpile tolerances shown in Table 335-8 for all of the sieve sizes and the five sand equivalent tests meets the requirement shown in Table 3357, then the stockpile is accepted.

Asphalt Content: Calculate the percent asphalt content of the mixture at least three times per day. The inspector shall randomly determine the timing for the readings used to calculate asphalt content.

Application Rate: Calculate the yield of the course placed at least three times per day. The on-site inspector shall randomly determine the timing for the readings used to calculate application rate.

#### Documentation.

Complete a daily report that includes the following information:

1. Job number
2. Route/Street Name(s)
3. Owner's On-Site Representative
4. Date
5. Air temperature – Min/Max (during application)
6. Unit weight of emulsion (pounds per gallon)
7. Beginning and ending application locations
8. Counter readings (beginning, ending, and total difference)
9. Total area (square yards)
10. Aggregate weight
11. Gallons of emulsion
12. Application rate (pounds per square yard)
13. Contractor's authorized signature
14. QC aggregate properties (if required)
15. Asphalt emulsion bill of lading(s)

#### Acceptance.

Allow the City Engineer access to in-progress work for quality assurance review and testing. Upon completion of work, schedule an inspection with the city inspector. The inspector will note deficiencies. Any deficiencies identified during this process will be addressed by the Contractor at no additional cost.



# STORMWATER MANAGEMENT

## SECTION 4



## 4.1 DEFINITIONS

Unless specifically defined below, words or phrases shall be interpreted so as to give them the meaning they have in common usage and to give this article its most reasonable application.

Words used in the singular shall include the plural and the plural the singular; words used in the present tense shall include the future tense. The word “may” is permissive.

**Acre-Foot.** Acre-foot means the volume of water that will cover one (1) acre to a depth of one (1) foot.

**Agricultural Land.** An Agricultural Land means those lands in actual agricultural use and for which an agricultural tax exemption has been granted.

**Applicant.** An Applicant means the person applying for a permit to proceed with a project.

**Arterial Street and Highways.** Arterial Street and Highways mean those which are used primarily for fast or heavy traffic.

**Artificial Drainage System.** Artificial Drainage System means any gutter, ditch, culvert, storm sewer or any other man-made facility which is to be or was installed to control the flow of surface water or groundwater.

**Aquifer.** Aquifer means an underground formation permeable enough to transmit, store, or yield quantities of salt or fresh water.

**As-built plans.** As-built plans mean the amended site plans specifying the locations, dimensions, elevations, capacities, and capabilities of structures or facilities as they have been constructed.

**Base Flow.** Base Flow means stream discharge derived from ground water sources. May sometimes be considered to include flows from regulated lakes or reservoirs.

**Catch Basin.** Catch Basin means the lower portion of a structure usually built at the curb line of a street, for the admission of surface water to a storm sewer, which is designed to retain grit and debris below the point of overflow.

**Channel.** Channel means a natural stream that conveys water. A ditch or channel excavated for the flow of water.

**Channel Stabilization.** Channel Stabilization means erosion prevention and stabilization of velocity distribution in a channel using drops, vegetation, revetments, and other measures.

**Chute.** Chute means a high-velocity, open channel for conveying water to a lower level without erosion.

**City Engineer.** City Engineer means the City Engineer or his/her designee.

**Clearing.** Clearing means the removal of surface features such as trees, brush, and other structures from the land or artificial drainage system but shall not include mowing.

**Collector Streets.** Collector Streets means this which carry traffic and minor streets to the major system of arterial streets and highways, including the principal entrance streets of a residential development and streets for circulation within such a development.



**Construction.** Construction means any activity including land clearing, earth moving, or the erection of structures, which will result in the changes of Stormwater Runoff.

**Control Elevation.** Control Elevation means the lowest elevation at which water can be released through the discharge structure.

**Control Structure.** Control Structure means the element of a Stormwater discharge structure, which allows the gradual release of water under controlled conditions.

**Contour.** Contour means an imaginary line on the surface of the earth connecting points of the same elevation.

**Cross-Section Slope (Street).** Cross-Section Slope (Street) means the slope of pavement perpendicular to the centerline.

**Culvert.** Culvert means a conduit for the conveyance of Stormwater Runoff.

**Curb and Gutter Section.** Curb and Gutter Section means a curb section constructed integrally with gutter.

**Curb Inlet.** Curb Inlet means a structure that collects Stormwater Runoff from a curb and gutter system.

**Cut.** Cut means a portion of land surface or area from which earth has been removed or will be removed by excavating, the depth below original ground surface of excavated surface.

**Cut and Fill.** Cut and Fill means a process of earth moving by excavating part of an area and using the excavated material for adjacent embankments or fill areas.

**Dam.** Dam means a barrier to confine or raise water for storage, detention, or diversion, to create a hydraulic head, to prevent erosion downstream, or for retention of soil or other debris.

**Datum.** Datum means a plane, level, or line from which heights and depths are calculated or measured.

**Depression Storage.** Depression Storage means watershed or drainage basin capacity to retain water in puddles, depressions and/or foliage.

**Design Highwater.** Design Highwater means the elevation of the water surface as determined by the flow conditions of the design storm events.

**Design Life.** Design Life means that period of time for which a facility is expected to perform its intended function.

**Design Storm.** Design Storm means a selected rainfall pattern of specified amount, intensity, duration, and frequency that is used as a basis for design.

**Detention.** Detention means the collection and storage of surface water for subsequent controlled discharge at a rate which is less than the rate of inflow.

**Detention Time.** Detention Time means the theoretical time required to displace the contents of a tank or unit at a given rate of discharge (volume divided by rate of discharge).

**Detention Volume.** Detention Volume means the volume of water equal to the difference between overflow elevation and control elevation of a discharge structure times the average area of open surface storage (at the control elevation) behind the discharge structure.



**Developer.** A developer means any person who engages in development or development activity either on his own behalf or as the agent of an owner of property.

**Development or development activity.** Development or development activity means:

- (1) The construction, installation, demolition, or removal of a structure, impervious surface, or drainage facility; or
- (2) Clearing, scraping, grubbing, killing, or otherwise removing the vegetation from a site; or
- (3) Adding, removing, exposing, excavating, leveling, grading, digging, burrowing, dumping, piling, dredging, or otherwise significantly disturbing the soil, mud, sand, or rock of site.

**Dike.** Dike means an embankment to confine or control water.

**Direct Discharge.** Direct Discharge means discharge of Stormwater through a control structure to the receiving water body.

**Directly Connected Impervious Area (DCIA).** Directly Connected Impervious Area (DCIA) shall mean the impervious area within a basin that is hydraulically connected to the discharge point.

**Discharge or discharge point.** Discharge or discharge point means the point of outflow of water from a project, site, aquifer, drainage basin, or facility.

**Discharge Coefficient (Hydraulics).** Discharge Coefficient (Hydraulics) means the ratio of actual rate of flow to the theoretical rate of flow through orifices, weirs, or other hydraulic structures.

**Discharge Structure.** Discharge System means a structural devise through, or over which water is discharged from a Stormwater management system.

**Disturbed Area.** Disturbed Area means the area of land disturbed by development or construction.

**Ditch Bottom Inlet.** Ditch Bottom Inlet means a structure to collect Stormwater Runoff that is flush or elevated with the surface.

**Drain.** Drain means a buried pipe or other conduit (closed drain), a ditch (open drain) for carrying off surplus surface water groundwater.

**Drainage Facility.** Drainage Facility means the whole or part of the drainage system.

**Drainage Plan.** Drainage Plan means the detained analysis of land and the improvements to meet the requirements of this section.

**Drainage Soil.** Drainage Soil means a natural condition of the soil. Soil drainage refers to the frequency and duration of periods when the soil is free of saturation.

**Drainage System.** Drainage System means the system through which water flows; it includes all watercourses, water bodies, and wetlands.

**Drawdown.** Drawdown means lowing of the water surface (in open channel flow), water table or piezometric surface (in ground water flow) resulting from a withdrawal of water.



**Dry Retention.** Dry Retention means a water storage area with the bottom elevation at least one (1) or two (2) feet or more above the wet season water table elevation. Retention storage percolates into the ground and evaporates rather than being discharged to receive water.

**Duration.** Duration means the period of time from beginning of a rainfall event to the end of a rainfall event.

**Effective Grain Size.** Effective Grain Size means the diameter of filter sand or other aggregate that corresponds to the ten (10) percent finer by weight on the grain size distribution curve.

**Elevation.** Elevation means the height in feet expressed in relation to mean sea level and referenced to the National Geodetic Vertical Datum (NGVD29).

**Embankment.** Embankment means a man-made deposit of soil, rock, or other material used to form an impoundment.

**Energy Dissipater.** Energy Dissipater means a device to reduce the energy of flowing water.

**Energy Gradient.** Energy Gradient means the total energy level of water at all points along a longitudinal line. It is the sum of the velocity head, pressure head and elevation of a flowing body of water.

**Environment.** Environment means the sum total of all the external conditions that may act upon an organism or community to influence its development or existence.

**Erodible.** Erodible means susceptible to erosion.

**Erosion.** Erosion means the wearing or washing away of soil by the action of wind or water.

**Erosive Velocity.** Erosive Velocity means that velocity of water in a stream, channel, canal, ditch, etc. which when exceeded will cause erosion of the banks and/or existing land.

**Evapotranspiration.** Evapotranspiration means the combined loss of water from a given area and during a specific period of time, by evaporation from the soil surface and by transpiration from plants.

**Event.** Event means the specific storm, which is or is to be considered in the design of a Stormwater management system.

**Exfiltration.** Exfiltration means on-site retention of Stormwater accomplished below ground. Stormwater runoff is collected for temporary storage and infiltration.

**Existing.** Existing means the average physical condition of the land and buildings on site immediately before development or redevelopment commences.

**Fill.** Fill means soil consolidated or unconsolidated material deposited on land or water.

**Filtration (to filter).** Filtration (to filter) means the act of filtering Stormwater runoff that has been collected in a detention area through filter media, which may include but not limited to aggregate, under drainpipe or filter fabric.

**First Flush.** First Flush means the first portion of runoff generated by rainfall event and containing the main portion of the pollutant load resulting from the storm.

**Flood.** Flood means a temporary rise in the level of any water body, watercourse, or wetland which results in the inundation of areas not ordinarily covered by water.



**Flood Plain.** Flood Plain means the lowland that borders a stream or channel and is subject to flooding when the stream or channel overflows its banks.

**Flood Prone.** Flood Prone means the lowland that borders a lake or natural depression and is subject to periodic inundation when the lake or natural depression overflows its banks.

**Flood Routing.** Flood Routing means determining the changes in the rise and fall of floodwater in a lake or as it proceeds downstream through a channel, natural stream, or reservoir.

**Flood Stage.** Flood Stage means the stage at which the overflow of the natural banks of a lake or stream begins.

**Floodway.** Floodway means a channel either natural, excavated, or bounded by dikes and levees used to carry excessive flood flows to reduce flooding. Sometimes considered to be the transitional area between the active channel and the flood plain. It is that portion of the flood plain which must be kept clear of encroachment in order to limit increase in flood stage to one (1) foot.

**Flume.** Flume means a constructed device lined with erosion-resistant materials intended to convey water on a steep grade.

**Freeboard.** Freeboard means a vertical distance between the elevation of the design highwater and the top of the bank, control structure, dam, or levee.

**Frequency of Storm (Design Storm Frequency).** Frequency of Storm (Design Storm Frequency) means the anticipated period in years that will elapse, based on average probability of storms in the design area, before a storm of a given intensity and/or total volume will recur or the probability that a storm of a given intensity and /or total volume will occur in any given year; thus a 25-year storm can be expected to occur on the average one every 25 years or have a 1/25 (4 percent) chance of occurring in any given year.

**Gage or Gauge.** Gage or Gauge means a device for registering precipitation, water level, discharge velocity, pressure, temperature, etc. A measure of the thickness of metal, e.g. diameter of wire, wall thickness of steel pipe.

**Grade.** Grade means the slope of a road, channel, pipe, drain, or natural ground. The finished surface of a canal bed, roadbed, top of embankment or bottom of excavation; any surface prepared for the support of construction such as paving or the laying of conduit pipe, etc.

**Gradient.** Gradient means the change of elevation, velocity, pressure or other characteristics per unit, slope.

**Grading.** Grading means any stripping, cutting, filling, stockpiling, or any combination thereof, including the land in its cut and fill condition.

**Groundwater.** Groundwater means water beneath the surface of the ground, whether or not flowing through known and definite channels.

**Groundwater Infiltration.** Groundwater Infiltration means the seepage of groundwater into an opening in a sewer.

**Groundwater Recharge.** Groundwater Recharge means the inflow or seepage into the groundwater table by natural and/or artificial means.



**Ground Runoff.** Groundwater Runoff means that part of groundwater that is discharged by seepage or springs into a lake, stream, and/or other natural water bodies. Major flow for base flow determinations.

**Groundwater Table.** Groundwater Table means the free surface of the groundwater, that surface subject to atmospheric pressure under the ground, generally rising and falling with the season, the rate of withdrawal, the rate of restoration, and other conditions. It is not a static condition.

**Head Hydraulics.** Head Hydraulics means the height of water above any plain of reference. The energy, either kinetic or potential, possessed by each unit weight of a liquid expressed, as the vertical height through which a unit weight would have to fall to release the average energy possessed. Used in various compound terms such as pressure head, velocity head, and lost head.

**Headwater.** Headwater means the source of a stream. The water upstream from a structure or point on a stream.

**Hydrograph.** Hydrograph means a graph that shows the time distribution of runoff at a point of interest. A typical hydrograph for a single storm consists of a curve with a rising limb, a peak, and a receding limb. The shape of the curve depends on the duration and intensity of the rainfall, and drainage characteristics of the basin.

**Hydraulic Conductivity.** (see Permeability)

**Hydrologic Cycle.** Hydrologic Cycle means the circuit of water movement from the atmosphere to the earth and back to the atmosphere through various stages or processes such as precipitation, interception, runoff, infiltration, percolation, storage evaporation, and transpiration.

**Illicit Discharge.** Illicit Discharge means the illegal dumping or disposal of waste in a stormwater sewer system that is not comprised entirely of stormwater.

**Impervious Surface.** Impervious Surface means a surface which has been compacted or covered with a layer of material so that it is highly resistant to infiltration by water. The term includes most conventionally surfaced streets, roofs, sidewalks, parking lots, and similar structures.

**Impoundment.** Impoundment means to retain water by artificial means.

**Indirect Discharge.** Indirect Discharge means discharge of Stormwater from a system by means other than a control structure.

**Indirect Runoff.** Indirect Runoff means that portion of runoff that contributes to the total runoff that enters the receiving system by indirect means (i.e. grassed area) not directly connected to the receiving system.

**Infiltration Percolation.** Infiltration Percolation means an approach to land application in which Stormwater runoff is applied to the land, by natural or man-made means, infiltrate the surface and percolate through the soil pores.

**Infiltration Rate.** Infiltration Rate means a soil characteristic determining or describing the rate at which water can enter the soil under specific conditions, including the presence of an excess of water. Rate normally is not constant.



**Initial Abstraction.** Initial Abstraction means initial precipitation loss including interception and depressed storage.

**Inlet.** Inlet means the opening into a storm sewer system for the entrance of surface storm runoff.

**Intercepted Stormwater Runoff.** Intercepted Stormwater Runoff means that portion of surface runoff that enters a sewer directly through a curb inlet and/or other methods.

**Intermittent Watercourse.** Intermittent Watercourse means a stream or portion of a stream that flows only in direct response to precipitation.

**Invert.** Invert means the lowest point on the inside of a sewer or other culvert.

**Lag Time.** Lag Time means the interval between the center of mass of the storm precipitation and the peak flow of the resultant runoff.

**Land.** Land means the earth, water, air, above, below, or on the surface, and includes any vegetation, improvements, or structures.

**Landlocked.** Landlocked means the condition of a permanent water body in which, under normal rainfall conditions, it has no definitive surface or conduit outfall to the ocean.

**Lining.** Lining means impervious material such as concrete, clay, plastic, etc., placed on the sides and bottom of a ditch, channel, and other water bodies to prevent or reduce the seepage of water through the sides and the bottom and/or prevent erosion.

**Low Impact Development (LID).** Low Impact Development (LID) means a design strategy with the goal of maintaining or replicating the pre-development hydrologic regime through the use of design techniques to create a functionally equivalent hydrologic site design. Hydrologic functions of storage, infiltration, and ground water recharge, as well as the volume and frequency of discharges are maintained through the use of integrated and distributed micro-scale stormwater retention and detention areas, reduction of impervious surfaces, and the lengthening of runoff flow paths and flow time. Other strategies include the preservation/protection of environmentally sensitive site features such as a riparian buffer, wetlands, steep slopes, valuable (mature) trees, flood plains, woodlands, and highly permeable soils.

**Maintenance.** Maintenance means that action is taken to restore or preserve the functional intent of any facility or system.

**Marginal Access Streets.** Marginal Access Streets means minor streets which are parallel to and adjacent to arterial streets and highways; and which provide access to abutting properties and protection from through traffic.

**Minor Streets.** Minor Streets means those that are used primarily for access to the abutting properties.

**Natural Flow.** Natural Flow means the flow patterns of Stormwater runoff over the land in its predevelopment state; elements of natural drainage include overland flow, swales, depressions, natural watercourses, etc.

**Natural System.** Natural System means systems which predominantly consist of or use those communities of plants, animals, bacteria, and other life systems which naturally occur on the land, in the soil or in the water.



**Nutrient.** Nutrient means a substance necessary for the growth and reproduction of organisms. In water those substances that promote growth of algae and bacteria - chiefly, nitrates and phosphates.

**Off-Line.** Off-Line means the storage of a specified portion of the Stormwater in such a way that subsequent runoff in excess of the specified volume of Stormwater does not flow into the area storing the initial Stormwater.

**Open Drain.** Open Drain means a natural watercourse or constructed open channels that convey drainage water.

**Outfall.** Outfall means the point, location, or structure where Stormwater runoff discharges from a sewer to a receiving body of water.

**Outlet.** Outlet means a point of Stormwater disposal from a stream, river, lake, or artificial drain.

**Outlet Channels.** Outlet Channels means a waterway constructed or altered primarily to carry water from man-made structures.

**Overflow.** Overflow means a pipeline or conduit device together with an outlet pipe that provides for the discharge of portions of sewer flows into receiving water, or other points of disposal after a regular device has allowed the portion of the water which can be handled by the storm sewer lines be carried by.

**Overflow Elevation.** Overflow Elevation means design elevation of a discharge structure at which or below which, water is contained behind the structure for that which leaks out or bleeds out through a control device down to the control elevation.

**Owner.** Owner means the person in who is vested the fee ownership, dominion, or title of property, that is the lawful proprietor. This term may also include a tenant, if, under his lease, he is responsible for the maintenance of the property; also, any agent of the owner or of the tenant including a developer.

**Peak Discharge.** Peak Discharge means the maximum instantaneous flow from a given storm condition at a specific location.

**Percolation.** Percolation means the movement of water through soil.

**Percolation Rate.** Percolation Rate means the rate usually exposed as a velocity at which water moves through saturated granular material.

**Percolation Test.** Percolation Test means a determination of the rate of percolation or seepage of water through natural soils expressed as time in minutes for one (1) inch fall of water in a test hole.

**Permanent Pool.** Permanent Pool means that portion of a wet detention pond, which normally holds water, for example: between the normal water level and the pond bottom, excluding any water volume claimed as wet detention treatment volume.

**Permeability.** Permeability means the property of a soil which allows the seepage of fluids through its interconnected void spaces, or more simply, the permeability describes how water flows through a soil. Units commonly used are cm/sec for laboratory work, or ft/day for the design of engineering works.



**Persons.** Persons means any and all persons, including an individual, firm, corporation, government agency, business trust, estate trust, partnership, association, two (2) or more persons having a joint for common interest, or any other legal entity.

**Pervious.** Pervious means allowing movement of water.

**Pervious Pavement.** Pervious Pavement is a material which when placed has included all required soil stabilization, base, and subbase, the same or greater permeability as the soil under pre-development conditions.

**Pollutants.** Pollutants means dredge spoil, solid wastes, incinerator residue, sewage, garbage, sewage sludge, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, and industrial municipal and agricultural waste discharge into water.

**Pollution.** Pollution means the presence in waters of the state of any substances, contaminants, man-made or man-induced, impairment of waters or alteration of the chemical, physical, biological, or radiological integrity of water in quantities, or at levels which may or may not be potentially harmful or injurious to human health or welfare, animal or plant life, or property which unreasonably interfere with the enjoyment of life of property, including outdoor recreation unless authorized by applicable law.

**Porosity.** Porosity means the volume of pore space in a rock.

**Porous Pavement.** Porous Pavement means a pavement through which water can flow at significant rates.

**Post-Development Condition for Stormwater Runoff.** Post-Development Condition for Stormwater Runoff means topography, vegetation, rate, volume, direction, and pollution load of Stormwater or groundwater flow that will exist after development.

**Pre-Development Condition for Stormwater Runoff.** Pre-Development Condition for Stormwater Runoff means topography, vegetation, rate, volume, direction, and pollution load of Stormwater or groundwater flow existing prior to development.

**Professional Engineer (PE).** Professional Engineer (PE) "Engineering Registration (also known as Engineering Licensing) in the United States means an examination process by which the State of Florida Board of Professional Engineering, (Department of Business & Professional Regulation) determines and certifies any person has achieved a minimum level of competence. This process protects the public by preventing unqualified individuals from offering engineering services.

**Project.** Project means the particular structures and improvements to a site proposed by an applicant on a particular land area, which may be part of a common plan of development and shall include the subdivision of land.

**Rainfall Intensity.** Rainfall Intensity means the rate at which rain is falling at any given instant, usually expressed as inches per hour.

**Rate.** Rate means volume per unit of time.

**Receiving Bodies of Water.** Receiving Bodies of Water means any water bodies, watercourses, and wetlands into which surface water flows.



**Recharge.** Recharge means the inflow of water into a project, site, aquifer, drainage basin or facility.

**Registered Land Surveyor.** Registered Land Surveyor means an examination process by which the Department of Professional Regulation of the State of Florida determines and certifies that a person has achieved a minimum level of competence. This process protects the public by preventing unqualified individuals from offering topographic services.

**Retention.** Retention means the collection and storage of runoff without subsequent surface discharge to receiving water.

**Retention/Detention Area (Dry).** Retention/Detention Area (Dry) means water storage area with bottom elevation at least one (1) foot above the control elevation of the area.

**Retention/Detention Area (Wet).** Retention/Detention Area (Wet) means water storage area with bottom elevation lower than one (1) foot above the control elevation of the area.

**Retention Structure.** Retention Structure means a natural or artificial basin that functions similar to a detention structure except that it maintains a permanent water supply.

**Retrofitting.** Retrofitting means improving the quality of urban Stormwater runoff to whatever degree is achievable. The improvement can include the existing system modification or the addition of new structures or Stormwater management practices, or changes in activities or land uses.

**Riprap.** Riprap means the use of man-made or natural materials placed on earth surfaces for protection against the erosive action of water.

**Risers.** Risers mean the inlet portions of a drop inlet spillway that extend vertically from the pipe conduit barrel to the water surface.

**Routing.** Routing means storing, regulating, diverting, or otherwise controlling the peak flows of Stormwater runoff through a collection system according to some predetermined plan or design.

**Runoff.** Runoff means the portion of precipitation that flows from a drainage area on the land surface in open channels or in Stormwater conveyance systems.

**Runoff Coefficient.** Runoff Coefficient means a decimal number used in the Rational Formula, which defines the runoff characteristics of the drainage area under consideration. It may be applied to an entire drainage basin as a composite representation or may be applied to a small individual area such as a one (1) residential or commercial lot.

**Saturation Point.** Saturation Point means in soils, the point at which a soil or an aquifer will no longer absorb any further amount of water without losing an equal amount of water.

**Seasonal High Groundwater Table Elevation.** Seasonal High Groundwater Table Elevation means the highest level of the saturated zone in the soil in a year with normal rainfall.

**Sediment.** Sediment means solid material, whether mineral or organic, that is in suspension, is being transported, or has moved from its site or origin by air, water, or gravity.

**Sediment Discharge.** Sediment Discharge means the quantity of sediment, measured in dry weight or by volume, transported through a stream cross-section in a given time. Sediment discharge consists of both suspended load and bed load.



**Sediment Facility.** Sediment Facility means any structure or area which is designed to hold runoff water until suspended sediments have settled.

**Semi-Impervious.** Semi-Impervious means land surfaces which partially restrict the penetration of water; include as examples are porous concrete and asphalt pavements, lime rock, and certain compacted soils.

**Site.** Site means any tract, lot, or parcel of land or combination of tracts, lots, or parcels of land which are in one ownership, or are contiguous and in diverse ownership where development is to be performed as part of a unit, subdivision, or project.

**Slope.** Slope means a degree of deviation of a surface from the horizontal; measured as a numerical ratio, percentage, or in degrees. Expressed as a ratio, the first number is the horizontal distance and the second is the vertical distance, as 2:1. A 2:1 slope is a 50 percent slope.

**Soil.** Soil means the unconsolidated mineral and organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.

**Soil Conservation.** Soil Conservation means using soil within the limits of its physical characteristics and protecting it from the unalterable limitations of climate and topography.

**Spillway.** Spillway means a passage such as a paved apron or channel for surplus water over and around a dam or similar obstruction. An open or closed conduit is used to convey excess water from a lake or reservoir. It may contain gates, either manually or automatically controlled, to regulate discharge of excess water.

**Storage Capacity.** Storage Capacity means the volume of water which can be impounded by the structure below the emergency spillway crest and above the wet season water table.

**Storm Frequency.** Storm Frequency means the time interval between major storms of predetermined intensity and volumes of runoff which storm drainage systems and such appurtenant structures are designed and constructed to handle hydraulically without surcharging and back flooding, (e.g., a five-year, 10-year, or 25-year storm).

**Storm Sewer.** Storm Sewer means a sewer that carries Stormwater and surface water.

**Stormwater Runoff.** Stormwater Runoff means the flow of water which results from, and which occurs and immediately following a rainfall event.

**Stormwater Management System.** Stormwater Management System means a system which is designed and constructed or implemented to control discharges which are necessitated by rainfall events, incorporating methods to collect, convey, store, absorb, inhibit, treat, use, or reuse water to prevent or reduce flooding, over drainage environmental degradation, and water pollution or otherwise affect the quality and quantity of the discharges.

**Street Curb.** Street Curb means the lateral side of the pavement determined by either a vertical or sloped section.

**Structure.** Structure means anything constructed, installed, or portable - the use of which requires a location on a parcel of land.

**Sub-Basin.** Sub-Basin means a physical division of a larger basin associated with one reach of the storm drainage system.



**Subdivision.** Subdivision means the division of a tract or parcel of land into two (2) or more tracts or parcels.

**Surcharge.** Surcharge means the flow condition occurring in a closed conduit when the hydraulic grade line is above the crown of the storm sewer.

**Surface Water.** Surface Water means all water, the surface of which is exposed to the atmosphere.

**Suspended Solids.** Suspended Solids means solids either floating or suspended in water.

**Swale.** Swale means a natural or man-made drainage pathway, which if man-made has a top width to depth ratio of the cross section equal to or greater than 6:1 or side slopes equal to or greater than three.

(3) feet horizontal to one (1) foot vertical; and has a grade as flat as the topography and design conditions will allow; and only contains contiguous areas of standing or flowing water following the occurrence of rainfall or flooding; and is planted with vegetation suitable for soil stabilization, Stormwater treatment, and nutrient uptake.

**Trail water Depth.** Trail water Depth means the depth of flow immediately downstream from the discharge structure, or at the point of discharge.

**Time of Concentration.** Time of Concentration means the time required for storm runoff to flow from the most remote point of a drainage area to the outlet or point under consideration. It is not constant but varies with the depth of flow, grades, and conditions of conduit/or channel.

**Time of Flow.** Time of Flow means the time required for water to flow in a storm drainage system from the point where it enters to any given point or location beyond that point of entrance.

**Topography.** Topography means general term to include characteristics of the ground surface such as plains, hills, etc., degree of relief, steepness of slope, and other physiographic features.

**Underdrain of Subsurface Drain.** Underdrain of Subsurface Drain means a drainage system installed beneath a Stormwater holding area to improve the infiltration and percolation characteristics of the natural soil when permeability is restricted due to periodic high water table conditions or the presence of layers of fine textured soil below the bottom of the holding area. These systems usually consist of a system of interconnected below-ground conduits such as perforated pipes, which simultaneously limit the water table elevation and intercept, collect, and convey Stormwater runoff which has percolated through the soil.

**Underground Exfiltration Trench or Exfiltration Trench.** Underground Exfiltration Trench or Exfiltration Trench means an underground system consisting of a conduit such as perforated pipe surrounded by natural or artificial aggregate, which is utilized to percolate Stormwater into the ground.

**Uniform Flow.** Uniform Flow means a state of steady flow when the mean velocity in the cross-sectional area remains constant in all sections of a reach.

**Urban Runoff.** Urban Runoff means surface runoff from an urban drainage area that reaches a stream, storm drainage system or other body of water.

**Vegetation.** Vegetation means all plant growth, especially trees, shrubs, vines, ferns, mosses, and grasses.



**Volume.** Volume means occupied space, measured in cubic units.

**Water and Community Waters.** Water and Community Waters means any and all water on or beneath the surface of the ground or in the atmosphere. It includes the water in any watercourse, water body, or drainage system. It also includes diffused surface water and water percolating. Standing, or flowing beneath the surface of the ground, as well as coastal waters.

**Water Body.** Water Body means any natural or artificial pond, lake, reservoir, or other area which ordinarily or intermittently contains water, and which has a discernable shoreline.

**Water Quality.** Water Quality means to describe the chemical, physical and biological characteristics of water usually in respect to its suitability for a particular purpose.

**Water Resources.** Water resources mean a supply of ground water and surface water in a given area.

**Water Table.** Water Table means the boundary between the zone of saturation and the zone of aeration. The water varies with such factors as tides, amount of rainfall, and evaporation.

**Watercourse.** Watercourse means any natural or artificial stream, creek, channel, ditch, canal waterway, gully, ravine, or wash in which water flows in a definite direction, either continuously or intermittently, and which has a definite channel, bed, or banks.

**Watershed.** Watershed means the region drained by or contributing water to a stream, lake, or other body of water.

**Watershed Area.** Watershed Area means all land and water within the confines of a drainage divide or water problem area consisting in whole or in part of the land needing drainage.

**Watershed Management.** Watershed Management means use, regulation, and treatment of water and land resources of a watershed to accomplish stated objectives.

**Watershed Planning.** Watershed Planning means formulation of a plan to use and treat water and land resources.

**Weir.** Weir means a device for measuring or regulation of the flow of water.

**Weir Notch.** Weir Notch means the opening in a weir for the passage of water.

**Wetlands.** Wetlands mean those areas saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a dominance of vegetation adapted for life in saturated soil conditions. For the purposes of these regulations, wetlands are those areas which meet the following criteria:

(1) Those areas, which support a dominance of wetland vegetation types, are listed in the Rules of the Florida Department of Environmental Protection. (Chapter 17-312 F.A.C. Dredge and Fill Activities).

(2) Those areas associated with the soil types as mapped in the soil survey of Brevard County.

**Wet Detention.** Wet Detention means the collection and temporary storage of Stormwater in a permanently wet impoundment in such a way as to provide for treatment through physical, chemical, and biological processes with subsequent gradual release of Stormwater.

**Wet Season Water Table.** Wet Season Water Table means the level of groundwater during the time of year when the greatest amount of rainfall normally occurs.



## **4.2 APPLICABILITY**

All projects to be built in the City of Palm Bay that alter the existing land use by the addition of impervious surfaces (i.e. pavement, buildings, sidewalks, etc.) in excess of that which now exists, will be required to comply with the requirements of this guideline unless the project meets one of the following exceptions:

- (1) Singular lot for single family unit.
- (2) Singular lot for duplex family unit.
- (3) Modifications to an existing single-family unit that does not require zoning change.
- (4) Lots, parcels, units, etc., which are part of a larger tract, which has an approved and constructed drainage system in conformity with the Design Criteria Manual.
- (5) Any lot on which the building, structure, pavement, sidewalk, etc. does not create more than a total of 5,000 square feet of impervious surface.

## **4.3 SUBMISSION REQUIREMENTS**

The data required is considered a minimum in order for the Land Development Division to properly evaluate the proposed system and to ascertain its impact on existing facilities.

### **4.3.1 Information Requirements**

The following information must be submitted for review by the Land Development Division:

1. A general location map delineating the project and other physiographic information (i.e., nearby streets, storm drainage, water bodies, and canals).
2. A map of the project and vicinity at a scale typically around 1" = 100', but no smaller than 1" = 200', which shall show the following information:
  - (a) Project boundary
  - (b) Existing topography of the project at one (1) foot contour intervals extending one hundred (100) feet beyond project boundaries and, if relief is slight, additional spot elevations so that existing drainage patterns can be clearly established. Also contained on this map shall be the receiving storm drainage system, name of water body, and major watershed, which the project continues to the drainage boundary of the area of any lands outside the project limits contributing runoff to the projects
  - (c) Soil types including hydrologic classification.
  - (d) ) One-hundred-year flood elevation and boundary (if applicable) for the project.
3. A drawing of the proposed land use and land cover, including acreage and percentage of impervious surfaces.
4. Description of vegetative cover. Wetland areas should be identified.
5. Proposed construction phase(s) of project (if applicable).



6. Proposed development drainage basin boundaries, showing the direction of flows; areas of each basin; percentage of each soil classifications within boundaries; and off-site drainage areas which will be contributing flow to the site.
7. Rights-of-way and easements for the system (if applicable).
8. Location of Stormwater retention and detention facilities, including size, design capacity, side slopes, depth of pond, and retained/detained Stormwater under design conditions.
9. Receiving system(s) off-site for the discharge(s) from the project.
10. Location and size of internal storm drainage facilities.
11. Roadway widths for each street classification, including cross slopes.
12. Inlet locations.
13. Pre-development and post-development runoff including:
  - (a) Runoff characteristics (e.g., runoff curve number or coefficient).
  - (b) Normal wet season water table elevations.
  - (c) Curve number selection and infiltration potential shall be based on an on-site analysis of soils by a qualified geotechnical engineer. Infiltration potential and the extent of each soil type found on the site must be included.
  - (d) Time of concentration.
  - (e) Design storm includes duration, frequency, precipitation, and type of distribution.
14. Stage-storage computations of any storage areas such as retention/detention facilities used.
15. Stage-storage discharge computations for any retention/detention facilities.
16. Drawdown curve for detention/detention facilities to substantiate design.
17. Water surface profiles in all drainage system (for project greater than ten (10) acres for the design storm event (s)).
18. A description of the methodology, assumptions, parameters, and a copy of all such computations used to analyze the system shall be included with the submittal. If a computer program is used for the analysis, a copy of the computer printout shall be submitted to the City.
19. Complete description of measures to be implemented during the construction period to mitigate adverse quantity and quality impacts off-site.
20. Any temporary construction which may affect the on-site and /or off-site Stormwater management system prior to completion of the project.
21. Computations showing that the spacing of inlets is in conformity with the maximum allowable water spread on pavement as defined in this guideline.
22. A complete soil study by a qualified geotechnical engineer, which shall include his estimate of the normal wet season water table elevation.



For private stormwater facilities, a statement designating the entity which will be responsible for the operation and maintenance of the Stormwater Management System. Attached to the statement will be a defined maintenance and funding program to ensure said system will function for the purpose for which it was intended. If the entity responsible for the operation and maintenance is not the entity for whom the engineering plans, specifications, and design analysis was submitted for, then a letter will be also attached stating who the entity will be and its agreement to conform to the defined maintenance program.

#### **4.3.2 Submittal to Other Agencies**

Other agencies have jurisdiction within the City of Palm Bay. Submittal to the City does not preclude the requirement of the consultant to obtain any additional permits, which may be required.

Most of these agencies or governmental entities have established and refined design criteria for Stormwater management.

In some cases, established design parameters of those agencies contain conflicting standards or criteria. In the case of conflicting criteria, it is the intent of The City of Palm Bay Stormwater Management Ordinance to have the most stringent regulation govern.

The following is a synopsis of those agencies and governmental entities which have overlapping jurisdiction:

(1) St. Johns River Water Management District (SJRWMD)

(a)Has established a permitting information manual which outlines minimum standards, guidelines, and criteria for Stormwater management.

(b)Requires a management and storage of surface waters permit be obtained from District prior to site plan approval.

(c)Boundaries of jurisdiction established by state statute.

(2) Florida Department of Environmental Protection (FDEP)

(a)Has established permitting criteria, which outline minimum standards, guidelines, and criteria for Stormwater management.

(b)Requires a Stormwater management permit to be obtained, or an exemption claimed, from the Department prior to site plan approval.

(c)Boundaries of jurisdiction – Statewide.

(d)Stormwater permitting within jurisdiction of The Water Management District is handled by SJRWMD.

(e)Has established permitting criteria for dredge and fill operations within the waters of the State.

(3) Florida Department of Transportation (FDOT)

(a)Has established minimum standards guidelines, and criteria for projects draining into FDOT rights-of-way.



(b) Requires a drainage connection permit to be obtained from the Department prior site plan approval.

(c) Requires periodic inspections and/or supervision of work performed within state road rights-of-way.

(4) Brevard County

(a) Has established minimum standards, guidelines, and criteria for water quality.

(b) Requires a review and approval of Stormwater management plans for projects draining into County drainage ways.

(c) Monitors water quality of natural lakes and riverine systems with Brevard County (including municipalities).

(5) Melbourne-Tillman Water Control District (MTWCD)

Maintains a large canal network which drains over 100 square miles in South Brevard County between the lower St. Johns River, and the Indian River Lagoon. The majority of land use within the District consists of suburban residential or agricultural (rangeland) uses. Currently, surface drainage from this area is routed through a large canal system discharging through the MS-1 structure to Turkey Creek which then flows onto the Indian River Lagoon.

(a) Has established minimum standards, guidelines, and criteria for projects draining to MTWCD canals

(b) Requires a drainage connection permit to be obtained from MTWCD prior to site plan approval.

## **4.4 HYDROLOGIC DESIGN CRITERIA**

### **4.4.1 Roadway Drainage**

The roadway pavement elevation shall be designed under the following criteria:

(1) Design Storm:

(a) 25-year, 24-hour storm event for any arterial, collector or major road projects.

(b) 10-year, 24-hour storm event for any local street or road.

(2) Flows may be determined by the rational formula.

(3) Under design conditions, the maximum spread allowed will be six (6) feet in the outside travel lane.

### **4.4.2 Retention/Detention Facility**

Retention/detention facilities shall be designed under the following criteria:

(1) Design storm shall be for a 10-year 24-hour, or 25-year 24-hour storm, whichever is the appropriate design storm.

(2) Runoff hydrographs shall be determined by one of the following methods:

(a) SCS Unit Hydrograph Method



(b) Santa Barbara Urban Hydrograph Method

(3) Minimum Treatment Volume:

(a) The strictest agency requirement.

(b) Runoff from the first one (1) inch of rainfall from entire site or one and one-half (1½) inches of runoff from the impervious area (whichever is greater of the two).

Retention systems shall be designed to recover one-half (½) of their volume in 24 hours and the entire volume in 72 hours.

(4) Minimum Detention Volume:

On site detention of Stormwater is required. The system shall be designed to detain a sufficient volume to restrict the post-development peak runoff to the pre-development peak runoff. The volume of storage required may include the retention volume.

## **4.6 HYDRAULIC DESIGN CRITERIA**

### **4.6.1 Roadway Drainage**

(a) All Streets shall be designed to provide a minimum clearance between the bottom of the base to a standing surface water condition or the wet season water table as follows: Local 1 foot.

(b) Collector 1½ foot

(c) Arterial 2 feet

(1) Grades - Minimum longitudinal grades shall be 0.2 percent. The minimum cross slope shall be one-quarter (1/4) inch per foot.

(2) Stormwater Spread into Travel Lane Inlets - Shall be placed at all low points, intersection, and along continuous grades to prevent the spread of water from exceeding one half the traveled lane width.

(3) Gutter Flow - A maximum distance of four hundred (400) feet shall be allowed to flow in a curb and gutter section to the first point of removal. A lesser distance may be dictated by the water-spread criteria.

(4) Valley Gutters - The use of valley gutters to convey Stormwater through an intersection is prohibited, unless approved by the Public Works Director on special conditions.

### **4.6.2 Storm Sewer Design**

(1) Allowable Materials - Reinforced concrete pipe, concrete box culverts, and bituminous-coated corrugated metal piped allowed. In no case will bituminous-coated corrugated, plastic, or metal pipe be allowed under roadways, unless approved by the Public Works Director.

(2) Minimum Pipe Size - The minimum size of pipe to be used is 15 inches in diameter.



(3)Minimum and Maximum Pipe Slopes - All storm sewers shall be designed and constructed to produce a minimum mean velocity of 2.5 feet per second. No part of the system will be designed to produce velocities in excess of five (5) feet per second.

(4)Design Tailwater - All storm sewer systems shall be designed taking into account the tailwater of the receiving facility for respective Storm events.

#### **4.6.3 Open Channel Design**

(1) Minimum Dimensions .

(a)Swale must be minimum of ten (10) feet wide with a minimum of depth of eight (8) inches.

(b)Side slope on any channel or pond must be a minimum of 3:1 slope with 4:1 or greater slope being more desirable.

(2)Minimum Right of Way or Easement Width - For facilities that are to be publicly maintained, a minimum of 20 feet on each side of the channel is required for a right-of-way or easement.

For facilities that are to be privately maintained, there must be no permanent structures within 20 feet at the top of bank unless the channel can be maintained from within the banks of the channel.

(3)Velocities - Outfall ditches and other open channels shall be designed so they will not overflow their banks, and they shall be designed for flow velocities such as will not cause scour. Where higher velocities must be used, ditch pavement, or other adequate permanent protection against scour shall be provided.

#### **4.6.4 Detention Facility Outfall Design**

(1)Pollution Abatement - All structures shall be designed to prevent floating oil and debris from discharging.

(2)Structures Utilized - All structures shall be of a permanent nature and be constructed in accordance with FDOT or City standards. Shop drawings will be submitted and approved by the Engineer prior to any installation of any drainage structures.

(3)Freeboard - Freeboard is the vertical distance between the elevation of the design highwater and the top of the bank. All structures shall be designed to provide six (6) inches of freeboard on sites less than three (3) acres and one (1) foot on sites three (3) acres or larger.



DRAINAGE SYSTEMS MATERIAL AND  
CONSTRUCTION  
SECTION 5



## **SECTION 5: DRAINAGE SYSTEM MATERIAL AND CONSTRUCTION**

### **5.1 SCOPE**

The scope of this Division includes materials and construction of drainage systems. The term drainage system includes sewers, ditches, swales, culverts, all detention/retention facilities, and all appurtenances.

### **5.2 PIPE**

Pipe of cement asbestos, cast iron, vitrified clay and polyvinyl chloride pipe shall not be allowed in the city drainage system.

#### **5.2.1 Reinforced Circular Concrete Pipe**

Pipe shall be cast vibrated, machine made or flatbed concrete pipe, designed, manufactured, cured, tested, and marked in accordance with ASTM C76. Pipe shall be of the class shown on the plans or called for on the Bidding Form. Pipe shall be manufactured in lengths not longer than sixteen (16) feet, nor shorter than eight (8) feet, except that shorter lengths as required at closures or junctions with structures shall be provided. Pipe with elliptical reinforcing shall be adequately marked to prevent improper placement in the trench.

Joints shall be of round rubber gasket type using a bell and spigot design. Joints shall be so designed that when the pipe is laid and joint completed, the gasket will be enclosed on all four surfaces. The joint shall be so designed and fabricated that when the pipe is laid, it shall be self-centering and the gasket shall not be required to support the weight of the pipe but shall keep the joint tight under all normal conditions of service including expansion, contraction, and earth settlement.

The rubber gasket shall conform to requirements stated in ASTM C361.

##### **5.2.1.1 Fiber Reinforced Concrete Pipe (FRCP)**

Pipe meeting ASTM C-1450 requirements as specified in FDOT Standard Specifications for road and bridge construction, 2004 edition, section 449-5 including revisions, and shall be installed in accordance with section 125 of FDOT Standard Specifications for the project application. Class III or higher pipe is allowed and will be determined based upon fill heights shown in FDOT Design Standards Index 205 (2004 Edition).

#### **5.2.2 Reinforced Elliptical Concrete Pipe**

Pipe shall be cast vibrated, machine made, or flatbed elliptically shaped concrete pipe designed, manufactured, cured, tested, and market in accordance with ASTM C507. Pipe shall be of the class shown on the plans or called for on the Bidding Form and shall be manufactured in lengths not longer than sixteen (16) feet, nor shorter than (8) feet, except that shorter lengths as required at closures or junctions with structures shall be provided. Pipe designed for placement with the major axis horizontal shall be designed as "Horizontal Elliptical Pipe" (Class HE-III) and shall be so marked.



Joints for elliptical pipe shall be cold adhesive preformed plastic gaskets conforming to Standard Specifications for Road and Bridge Construction FDOT, Section 942, paragraph 942-2. Installation of joint material shall conform to the requirements of Section 430, paragraph 430-7.3 of the above referenced specification.

### **5.2.3 Corrugated Steel Pipe**

Corrugated steel pipe, including round culvert pipe, pipe arch, and underdrain shall meet the requirements of the AASHTO-M36, utilizing a base metal of copper-bearing steel. Pipe shall be manufactured, furnished, and installed in standard lengths except at junctions with structures, which cannot be adjusted in location. Pipe shall be straight, true in form and of full diameter or specified cross-section throughout. After fabrication, the pipe shall be fully coated with a suitable bituminous material so the minimum thickness of the coating as measured on the crest of the corrugation shall be 0.05 inches. The bituminous material shall adhere to the metal tenaciously, shall not be susceptible to spalling under shock, shall not flow when subjected to summer temperatures and shall be impervious to moisture. The coating shall be resistant to the erosive action of hydraulic traffic and meet requirements of AASHTO M190.

When specified, paved inverts shall consist of asphalt cement applied on the inside of the pipe for one quarter of its circumference. The pavement shall have a minimum thickness of 0.50 inches measured on the crest of the corrugations at the centerline and shall taper to 0.1 inches at the sides.

Coupling bands shall be of the same gauge and material as the pipe and shall be at least ten (10) inches wide. The metal shall be corrugated, dimpled, or channeled to effectively engage the corrugations of the pipe. If watertight joints are specified, they shall be provided by "O" ring rubber gaskets which shall conform to ASTM C443 for annular end pipes. Water tightness for helical end pipe shall be provided by approved sealant or gasket materials.

Pipe for underdrains shall be the full circle types, and perforations in the pipe may be drilled or punched. Perforations shall be 3/8 inch and shall be uniformly spaced around the full periphery of the pipe. There shall be no less than 30 perforations per square foot of pipe surface. Care shall be taken the coating process does not reduce the open area below 3.31 square inches per square foot of pipe surface. Sleeve type couplings may be substituted for the band couplers.

### **5.2.4 Corrugated Aluminum Pipe**

Aluminum-alloy culvert pipe and underdrain shall meet the requirements of AASHTO-M196. The aluminum-alloy pipe arch shall meet the requirements of AASHTO-M219.

Bituminous coating, paved invert and coupling bands shall meet the requirements for corrugated steel pipe.

### **5.2.5 Polyethylene Pipe**

Upon the submittal by the project engineer to and approval by the Public Works Director or his representative of appropriate design information, plastic pipes shall be allowed.

Polyethylene pipe used shall meet all requirements of FDOT Standard Specifications for Road and Bridge Specifications, Section 948-2.



### **5.2.6 Pipe Cradle**

When ordered or indicated on the plans, pipe cradle shall be of 3000-PSI concrete.

### **5.2.7 Joint Wrapping**

All pipe joints are to be wrapped with filter fabric in accordance with FDOT Design Index 280.

## **5.3 MANHOLES**

### **5.3.1 Precast Reinforced Concrete Manholes**

Manholes shall conform to the requirements of ASTM C478.

Manholes shall consist of a base unit, riser units with necessary openings for sewer pipe and concentric cones or flat lids providing the support for the manhole frame and cover. The base unit shall consist of a monolithically poured base and bottom-ring section. Lifting holes through the structure shall not be permitted.

When called for the plans, a non-sag grade of polysulphide rubber filler shall be used in conjunction with compression ring.

### **5.3.2 Brick Manholes**

Brick for manhole construction shall be as specified on paragraph

The base shall be of 3000-PSI concrete.

The channel shall be a minimum of 2400-PSI concrete.

The mortar for brickwork and surface plastering shall be made with acid resistant cement.

### **5.3.3 Manhole Frames and Covers**

Manhole frames and covers shall be gray cast iron, shall be free from cracks, holes, and cold shuts and shall conform to Federal Specification QQ-I-65A for gray iron castings. Frames and covers shall conform to the details shown on the drawing and shall be coated with coal tar pitch varnish. Bearing surfaces shall be machined to provide even bearing surfacing or shall have a non-rocking feature.

### **5.3.4 Brick**

Concrete brick shall conform to ASTM C-139.

Clay brick shall be dense, hard burned and shall conform to ASTM Designation C-32 Grade MM or ASTM C62 Grade MW, except that brick absorption shall be between five and twenty-five grams of water absorbed in one minute by dried brick, set flat down in 1/8 inch of water.

### **5.3.5 Catch Basin**

Catch basins shall conform to the form and dimensions and be constructed of the materials shown in the FDOT Standards or on the standard plans whichever is specified.

Precast units shall conform to the requirements of ASTM C478 and to the form and dimensions called for on the plans.



The type of brick catch basins shall conform of form and dimension called for on the plans and all catch basins shall be constructed with 3000 PSI concrete strength. Mortar type of brickwork and surface plastering shall be made with acid resistant cement.

### 5.3.6 Catch Basin Frames and Grates

Cast iron frames and grates shall be gray cast iron conforming to ASTM A48, shall be free of cracks, holes, and shuts shall conform to the details shown on the plans or specified. Bearing surfaces shall be machined to provide an even non-rocking bearing surface.

Structural steel frames and grates shall be galvanized in accordance with the requirements of ASTM A-123 unless A-588 steel is used in the manufacture.

### 5.3.7 Headwalls, Valley Gutters, and Other Concrete Structures

Headwalls, valleys, gutters, and other concrete structures shall be constructed with 3000 -PSI concrete.

### 5.3.8 French Drain

Corrugated Pipe shall be steel or aluminum meeting the requirements of Articles 4.2.3 or 4.2.4 of this Division.

Ballast rock shall meet the gradations of ASTM Size No. 4 coarse aggregate or underground disposal of water, designation D 488-54.

#### Amount Passing (Square Openings) Weight Percent

Size	Normal Sizes	2"	1 ½	1"	3.4"	3.8"
<u>Numbe</u>	<u>Square</u>	<u>(50mm)</u>	<u>(37.5mm)</u>	<u>(25.0mm)</u>	<u>(19.0mm)</u>	<u>(9.53mm)</u>
4	1 ½ "to ¾ "	100	90 to 100	20 to 55	0 to 15	0 to 5

Aggregate shall be sound and durable.

Filter fabric shall be in accordance with FDOT Design Standards Index 199. It shall be the product of an established manufacturer. It shall manufacture in one piece to meet the trench size requirements, shall be free of tears and other imperfections.

### 5.3.9 Check Dam

Stone shall be ¾ inch, crushed, clean and durable rock.

Filter fabric shall be as specified in paragraph 4.15.3 of this Division.

Sod shall be either centipede or Bahia grass well matted with roots furnished in commercial size rectangles, 12 inch or larger.



## **5.4 CONSTRUCTION**

### **5.4.1 Excavation and Backfill**

(1)Trench – Trench width shall be kept to a minimum necessary for installation of the pipe. The trench bottom shall be graded uniformly to match the outside of the pipe.

(2)Unsuitable Material Below Pipe Grade – Wherever excavation of the trench exposes unsuitable materials such as peat, soft clay, quicksand, or other unstable material in the bottom of the trench, which in the opinion of the Engineer, is unsuitable foundation upon which to lay or support the pipe, backfill, and expected superimposed loads. Such unsuitable materials shall be removed to the depth necessary to reach material having adequate capacity. The trench shall then be backfilled to a point six (6) inches above the bottom of the pipe and the material shaped to fit the pipe. The material for bedding may be clean natural sand or gravel, imported quarry waste, selected excavation or a mixture thereof. Samples of the material shall be submitted sufficiently in advance of intended use to enable inspection and testing. The material shall be placed in six (6) inch layers and compacted to a dry density equal to 95 percent of the maximum dry density as determined by the Standard Proctor Compaction Test ASTM D690. Each layer shall be compacted to the required density prior to placing the next layer.

Backfill – Only good quality backfills, free of stones, roots, rocks, broken cement, or other material which might be damaging to the pipe shall be used. All backfill must be compacted by tamping from under the pipe up to 12 inches above the pipe. Backfill shall be compacted in lifts up to the surface to achieve a minimum compaction of 95 percent of maximum density in accordance with AASHTO T-180 and ASTM D-2167.

(3)Well-pointing – Construction shall be accomplished in a dry trench. Well-pointing or other approved methods of dewatering shall be carried out to maintain a dry trench.

Sheeting and shoring shall be installed as may be necessary for the protection of the work, preservation of adjacent property and structures, and the safety of employees.

### **5.4.2 Pipe Laying**

Pipe laying shall proceed upgrade with the spigot ends of the pipe pointing in the direction of flow. Each pipe shall be laid true to line and grade so as to form a close concentric joint with the adjoining pipe, preventing offsets in the flow line. As the work progresses, the interior of the pipe shall be cleaned of all dirt and superfluous materials. In addition, pipe shall be laid either on a prepared bed of undisturbed earth in the bottom of the trench, shaped as required to fit the pipe, or upon a layer of properly placed bedding material. The requirements for pipe bedding vary with the type of pipe to be installed and these requirements are set forth in other applicable paragraphs or the plans.

Pipe outfalls should have either concrete end treatments or extended one foot beyond normal water's edge. The concrete pipe should have joints secured in accordance with City of Palm Bay Standard Drainage Detail SD-12.



### **5.4.3 Manholes and Catch Basins**

Precast base shall be placed, or base shall be cast in place on undisturbed soil, or it shall be installed on approved bedding. Installation will be at the locations and to the grades shown on the plans before the pipe is laid to or away from the manhole or catch basin.

Brick manholes and catch basins shall be made to conform to the shape and dimensions shown on the drawings. For manholes, brick shall be laid radially with horizontal joints. Brick manholes and catch basins must have 1/2 inch of plaster on the outside.

All manholes and catch basins shall be constructed so that the top shall be set between 5½ inches and 14½ inches below the bottom of the frame. It is the intent of the Specifications to provide a minimum of 2½ inches to accommodate future grade changes without disturbing the manhole or catch basin.

The precast units with annular space between the pipe and the opening in the unit shall be grouted with Portland Cement mortar containing an approved additive to ensure a watertight joint.

Frames shall be centered over the opening, raised, and tilted as necessary to meet the roadway or finish grade by the use of brick shins and set in a full bed of mortar. Any cover or grating, which rocks in its frame upon installation, will not be accepted.

The headwalls, Valley gutters and other concrete structures shall be constructed to the forms and dimensions show on the plans or specified.

### **5.4.4 French Drains**

Excavation shall be made to the required depth after dewatering to two (2) feet below proposed trench bottom. After excavation, a slope form of plywood or steel shall be set lining the sides and ends of the trench. The filter fabric shall be draped over the forms forming an envelope. The ballast rock shall be placed in the bottom of the trench to the pipe invert. It shall be compacted to prevent subsequent pipe settling.

The pipe shall be set in place to the lines and grades indicated on the plans. Backfill shall be placed in layers and compacted to provide for elimination of all voids between the exterior of the filter fabric and the native soils forming the walls of the excavation. In order to accomplish this, the slip forms will gradually be pulled as each layer of ballast is placed but before compacting.

When the specified elevation is reached, the filter fabric will be laid over the top of the ballast rock and overlap a minimum of two (2) feet to prevent sediment infiltration into the ballast rock.

A minimum of six (6) foot wide bands of hay bales shall be firmly set around the periphery of the excavation to prevent premature surface flows of sediment carrying waters into the excavation. Upon completion of the backfill, a six- (6) foot wide band of sod shall be set around the periphery of riser pipe. To avoid premature flows into the drain, the construction shall be scheduled for complete construction in one working rainless day.



#### **5.4.5 Check Dams**

Check dams shall be constructed to the dimensions, lines, and grades shown on the plans.

After excavation to the required depth, the filter fabric shall be placed on the prepared bottom; the stone shall be placed on the fabric in a manner that will conform to the required configuration. The filter fabric will be laid over the stone and overlap a minimum of two (2) feet to prevent sediment infiltration into the ballast rock.

Sod shall be placed on the surface of the fabric with edges in close contact and shall be firmly and smoothly imbedded by light tamping. The edges of the sod shall be staggered to avoid a continuous seam along the line of flow.



# ELEMENT

## SECTION 6

### **SECTION 6: TRANSPORTATION MANAGEMENT ELEMENT**

#### **6.1 GENERAL**

To provide the developer with assistance in complying with the City of Palm Bay Traffic Operations for striping, pavement markings and signage guidelines. scope of this Division

#### **6.2 COMMERCIAL DEVELOPMENT**

The developer is to work with the Traffic Operation staff of the Public Works Department to identify the acceptable driveway locations and configurations.

Traffic Engineering staff will determine the area of influence required for the initial traffic study. Staff will work with developers and developer's engineering consultant to identify system



deficiencies. Development of Regional Impact (DRI) will have to satisfy County and State requirements.

Striping shall be four (4) inch white lines for lane lines. Loading zones and parking stalls shall be white. Blue/white/blue striping is required for disabled parking stalls. Four (4) inch yellow lines are required for double centerlines. Red is the approved color for fire lane marking. These markings shall be indicated on the curb and within the lane. Loading zones shall have the words "LOADING ZONE" and fire lanes shall have the words "FIRE LANE" in white. All paint shall be FDOT approved traffic paints. Stop signs and stop bars will be located on the owner's side of property unless otherwise directed. However, the maintenance of these traffic control devices shall remain the responsibility of the owner/developer.

Transportation Impact Fee (TIF) shall be calculated either from the ordinance or from the traffic impact analysis guideline and shall be paid at the time of building permit.

All plans shall be a minimum of 1inch = 50 feet scale.

Commercial sites may be required to provide cross access to adjoining properties in order to minimize the number of conflict points on the street system and internally.

Brevard County and FDOT access management guidelines will be implemented.

Speed bumps on commercial sites are not approved traffic control devices or roadway design features and prohibited. Speed humps have a different design, which has worked successfully and may be used at pedestrian crossing points as elevated crosswalk areas. The design of these speed humps must be approved by the City Engineer or his representative.

Adequate street lighting may be required at the developer's expense to light the intersection of project driveways.

Safe sight distances and safe stopping distances shall be maintained at all internal and external intersections. These distances are based on approach speeds and may be found in FDOT Roadway and Design Standards. Height and placement of vegetation are critical and must be designed to provide safe sight distances.

## **6.3 DESIGN CRITERIA**

### **6.3.1 General Site Plan**

The location and approximate size of the building footprint should be shown.

The retention areas shall be identified. A generalized location showing the proposed configuration of the ponds, swales, or other drainage facilities.

Provide a generalized landscape plan showing proposed buffer yards and plantings.

### **6.3.2 Relationship to Surrounding Properties**

Show how the proposed development will relate to the surrounding street network by including access points and identifying abutting streets within 200 feet of the proposed project.

The project shall indicate the relationship between the subject property and surrounding properties by identifying the location of adjacent driveways, buildings, retention areas and parking.

### **6.3.3 Parking**



Parking stalls should be provided on both sides of the aisles.

“Dead-End” parking aisles should be avoided whenever possible.

When “Dead-End” parking aisles are proposed, adequate reserve maneuvering space shall be provided to prevent use of buffers for turning.

“Dead-End” parking aisles should not exceed 100 feet in length.

Parking stall aisles should be perpendicular to buildings.

Parking aisles should be designed to minimize length search patterns, decrease the potential for speed, and improve traffic safety. Aisles should not exceed 200 feet in length.

When aisle lengths exceed 200 feet, the use of “chokers” should be explored for landscaping opportunities.

Parking in front of a structure should be avoided.

Parking should link with building approach and be within 300 feet of the building it serves.

This distance is typically considered a maximum walking distance for customers and visitors.

#### **6.3.4 Interior Circulation**

Commercial, Industrial, and Office land use designations, traffic circulation and maneuvering should be accomplished on site.

Driveway entrances and exits should be located as far as possible from street intersections. Truck radii shall be included as design features.

Driveway entrances and exits should be located near buildings to facilitate natural surveillance.

Driveway aisles, which cross main access aisles, should be located far enough from the public right-of-way to allow for safe stacking of vehicles.

Vehicles should be discouraged or prevented from taking shortcuts by the use of curbing, low hedges or other traffic control barriers.

Interior throughways within parking lots should be separate from parking aisle areas.

Interior circulation patterns and their relationship to off-site streets and improvements should be a higher priority than optimum size or location of building.

Peripheral out-parcels designed for free-standing land use should be an integral part of the total interior circulation plan for a larger site.

Driveways should align with opposing driveways and/or streets when access is planned on a public road or street.

When alignments of driveways/streets with opposing driveways/streets are not possible, a minimum of 150 feet should be provided between driveways/streets intersections.

Service areas can work in conjunction with parking areas; however, parking and service should be separate to reduce conflict.

Employee and customer parking aisles should be separate.

Joint driveways for adjacent businesses should be provided.



Curb cuts for driveways should be minimized and the number of cuts should relate to the lot size, turnover rate, relationship with adjoining street, and the type of clientele served. Truck turning radii for the type of expected truck deliveries should be included for driveways and internal aisle ends.

#### **6.3.5 Pedestrian Circulation**

Pedestrian drop-off locations should be designed to blend with the overall circulation pattern. The arrival and turnaround area should be designed for a right-handed drop off.

Crosswalks should be provided as needed and should provide adequate protection through striping and signage. Efforts should be made to provide sidewalks connecting to rights-of-way.

Sidewalk connections from on-site to existing street sidewalks are encouraged.

#### **6.3.6 Trash Collection Areas**

Trash collection points should be located to take advantage of existing trash collection routes and cause minimal maneuvering by sanitation vehicles. Care should be taken to assure that proper turning radii and angles of entry are designed to require only one backing maneuver and that the maneuver does not involve backing into a major access aisle (interior throughways) or public right-of-way.

#### **6.3.7 Transit Accommodations**

Sites that have potential or are currently bus stop points should incorporate and integrate such locations in the total site plan. If a bus stop is designed to serve a particular site or building, then the bus stop should be in close proximity to the building. Bus shelters will not impede pedestrian traffic, nor cause site obstructions. Proposed locations are to be approved by the City Engineer or his representative.

#### **6.3.8 Individual Impact Analysis**

The individual impact analysis will be determined based upon requirements included in this document and the Administrative Procedures Manual for the Fair Share Transportation Impact Fee Ordinance #91-10.

#### **6.3.9 Sidewalks/Bikes Paths**

Sidewalk/bike paths will be required for all developments according to City of Palm Bay Ordinances. Sidewalks connecting the building to the public roads is encouraged.

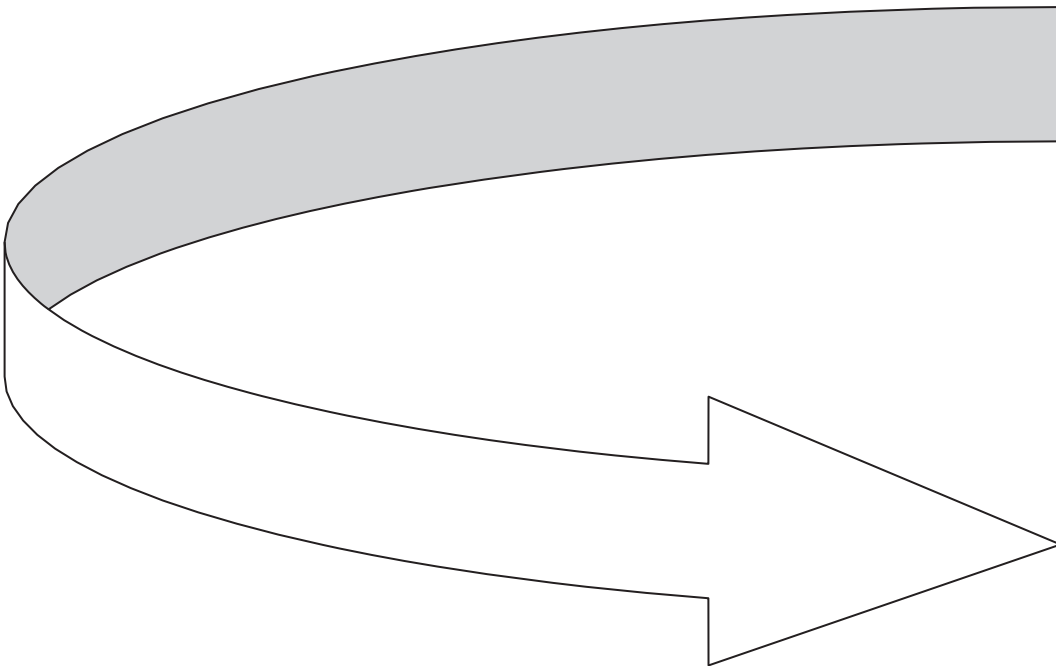
### **6.4 PRIVATE SINGLE FAMILY RESIDENTIAL DEVELOPMENT**

If the single-family residence is located on an arterial road, collector or subdivision collector road, the following apply:

- (1) Sidewalks must be included on the site plan located at the Right of Way line according to City of Palm Bay Code of Ordinances.
- (2) Circle driveways or turn-around driveways are required. Circle driveways should also be encouraged on the corner lots of a subdivision collector or collector and collector intersection.



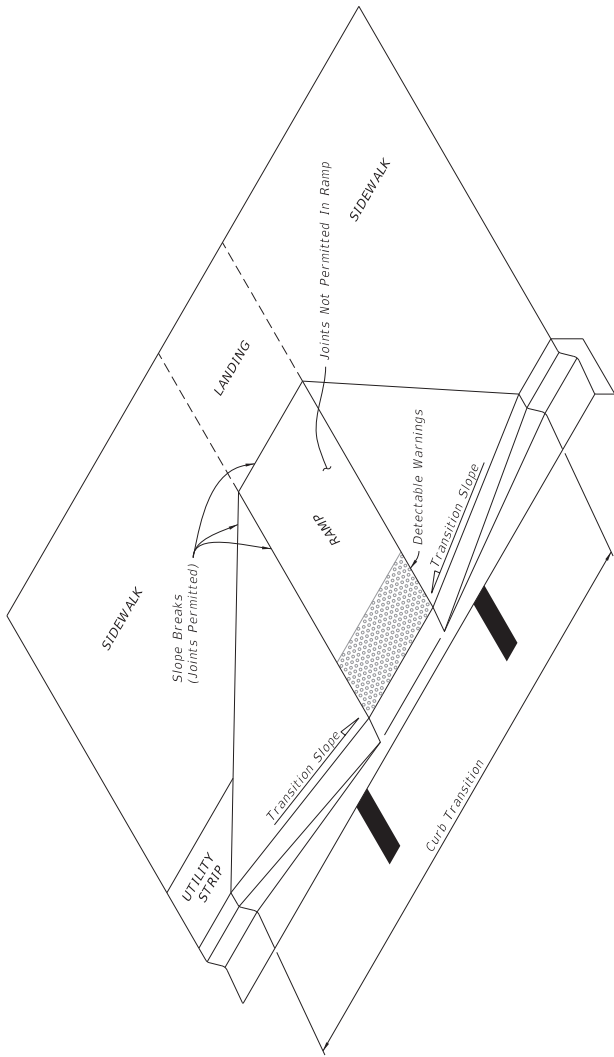
# APPENDIX DETAILS





GENERAL NOTES:

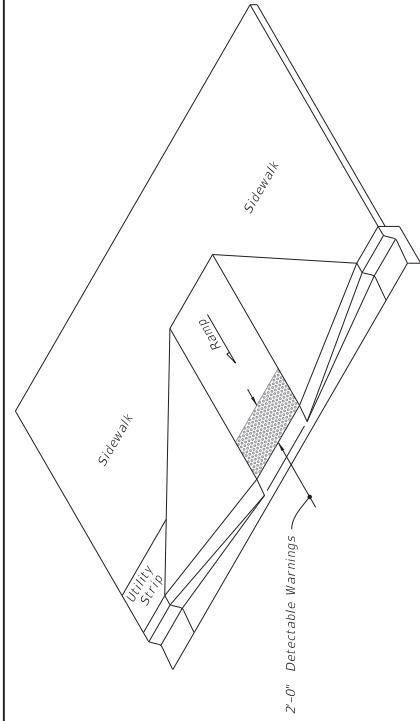
1. Cross Slopes and Grades:
  - A. Sidewalk, ramp, and landing slopes (i.e. 0.02, 0.05, and 1:12) shown in this Index are maximums. With approval of the Engineer, provide the minimum feasible slope where the requirements cannot be met.
  - B. Landings must have cross-slopes less than or equal to 0.02 in any direction.
  - C. Maintain a single longitudinal slope along each side of the curb ramp.
  - D. Ramp slopes are not required to exceed 15 feet in length.
  - E. Joints permitted at the location of Slope Breaks. Otherwise locate joints in accordance with Index 522-001. No joints are permitted within the ramp portion of the Curb Ramp.
2. Curb, Curb and Gutter and/or Sidewalk:
  - A. Refer to Index 522-001 for concrete thickness and sidewalk details.
  - B. Remove any existing curb, curb and gutter, or sidewalk to the nearest joint beyond the curb transition or to the extent that no remaining section is less than 5 feet long.
3. Curb Ramp Alpha-Identification:
  - A. Sidewalk curb ramp alpha-identifications (e.g. CR-A) are provided for reference purposes in the Plans.
  - B. Alpha-identifications CR-I and CR-J are intentionally omitted.
4. Detectable Warnings:
  - A. Install detectable warnings in accordance with Specification 527.
  - B. Place detectable warnings across the full width of the ramp or landing, to a minimum depth of 2 feet measured perpendicular to the curb line and no greater than 5 feet from the back of the curb or edge of pavement.
  - C. If detectable warnings are shown in the Plans on slopes greater than 5%, align the truncated domes with the centerline of the ramp; otherwise, the truncated domes are not required to be aligned.
5. Detectable Warnings - Acceptance Criteria:
  - A. Color and texture shall be complete and uniform.
  - B. 90% of individual truncated domes shall be in accordance with the Americans with Disabilities Act Standards for Transportation Facilities, Section 705.
  - C. There shall be no more than 4 non-compliant domes in any one square foot.
  - D. Non-compliant domes shall not be adjacent to other non-compliant domes.
  - E. Surfaces shall not deviate more than 0.10" from a true plane.



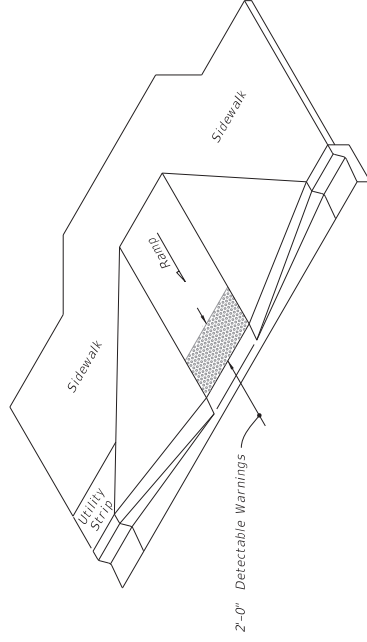
CURB RAMP NOMENCLATURE

LAST REVISION	DESCRIPTION:	FDOT	FY 2020-21 STANDARD PLANS	INDEX	SHEET
11/01/19				522-002	1 of 8

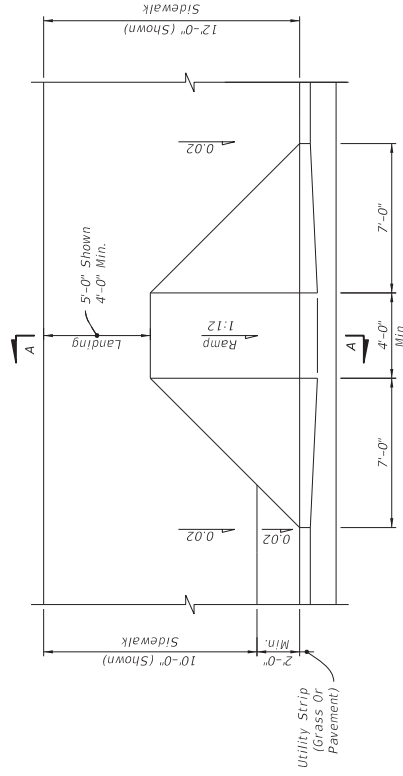




ISOMETRIC VIEW



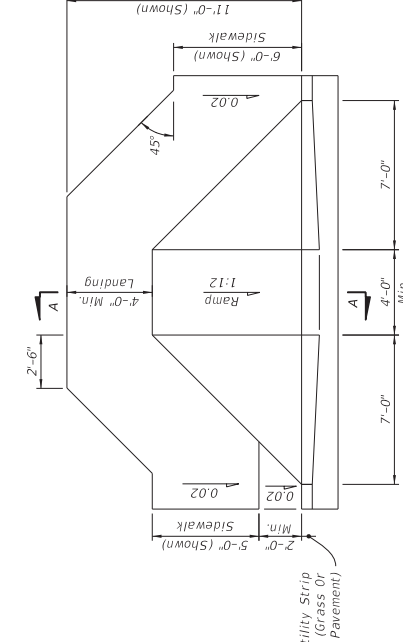
ISOMETRIC VIEW



PLAN VIEW

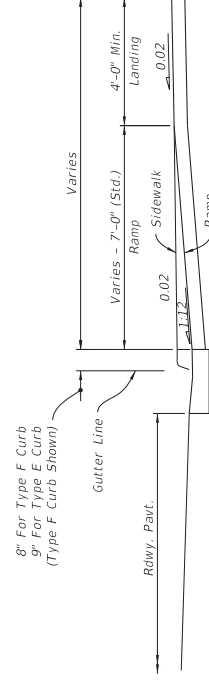
NOTE: For Example of CR-A used in Radial Curb Returns, See Sheet 8.

CR-A



PLAN VIEW

CR-B

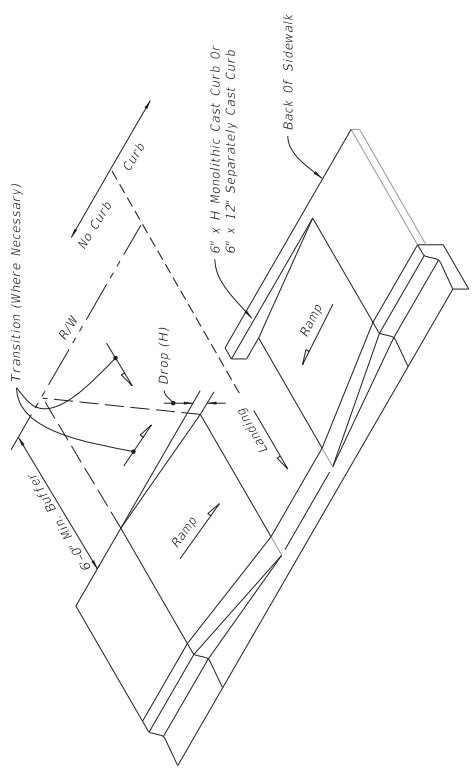


SECTION A-A

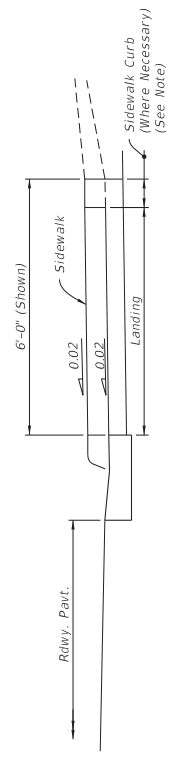
SIDEWALK CURB RAMP CR-A AND CR-B

LAST REVISION	DESCRIPTION:	FDOT	STANDARD PLANS	DETECTABLE WARNINGS AND SIDEWALK CURB RAMP	INDEX	SHEET
11/01/18					522-002	2 of 8

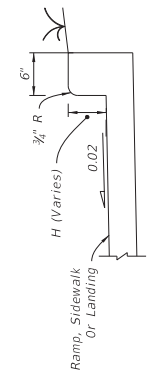




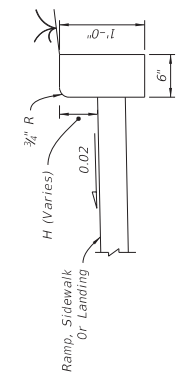
CONSTRUCTION OF SIDEWALK CURB IN CUT SECTIONS



NOTE: For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details.



MONOLITHIC CAST CURB

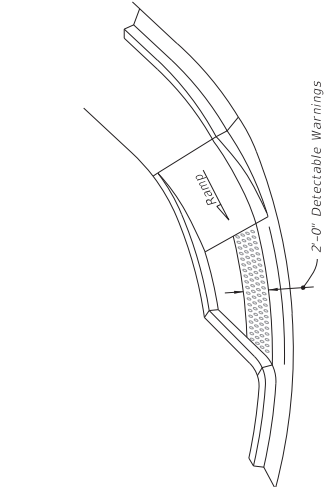


SEPARATELY CAST CURB

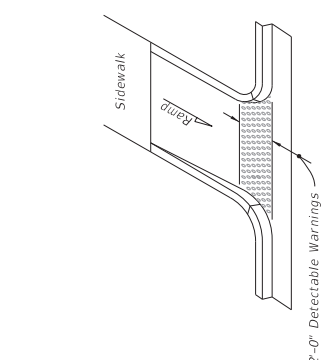
SECTION B-B SIDEWALK CURB OPTIONS

DESCRIPTION:		FY 2020-21 STANDARD PLANS		SIDEWALK CURB RAMPS CR-C AND SIDEWALK CURB	
LAST REVISION 11/01/18	REVISION	FDOT		DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS	
				INDEX 522-002	SHEET 3 of 8

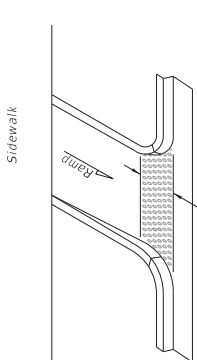




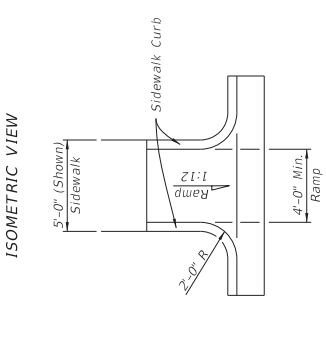
ISOMETRIC VIEW



OPTION A

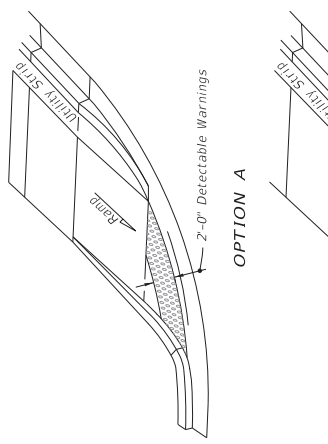


OPTION B

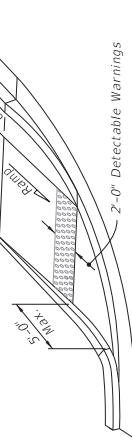


PLAN VIEW

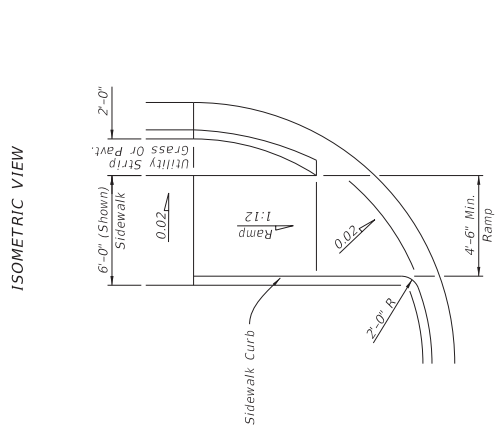
CR-E



OPTION A

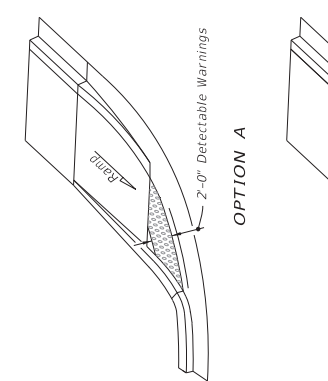


OPTION B

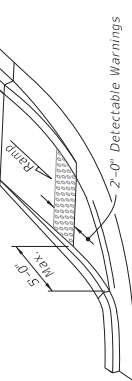


PLAN VIEW

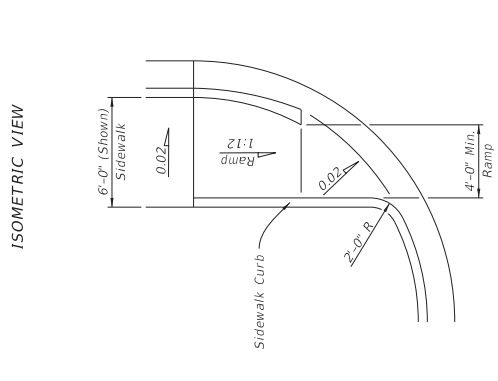
CR-F



OPTION A



OPTION B



PLAN VIEW

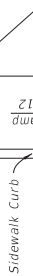
CR-G

SIDEWALK CURB RAMPS CR-D, CR-E, CR-F & CR-G		DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS		INDEX	SHEET
FY 2020-21		STANDARD PLANS		522-002	4 of 8
FDOT		DESCRIPTION:		REVISION	
LAST REVISION		11/01/18			

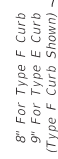




6'-0" (Shown)



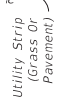
CR-H



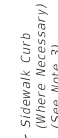
SECTION D-D =



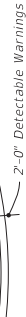
CR-K



CR-K



SECTION E-E



OPTION A



OPTION B


ISOMETRIC VIEW



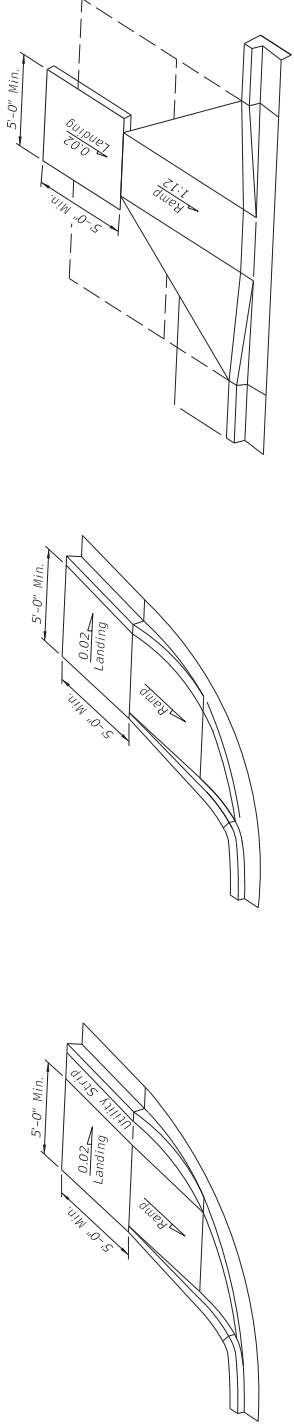
PLAN VIEW

1. Crosswalk Width and Configuration Vary: Must Conform to Index 711-001.
2. 15' Radius Curve Shown for CR-L.
3. For additional information on sidewalk curb construction, see SIDEWALK CURB OPTIONS details, on Sheet 3.

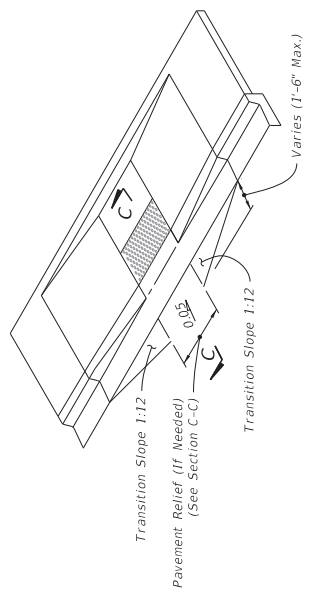
## SIDEWALK CURB RAMPS CR-H, CR-K &amp; CR-L

LAST REVISION 11/01/18	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS	INDEX	SHEET
				522-002	5 of 8

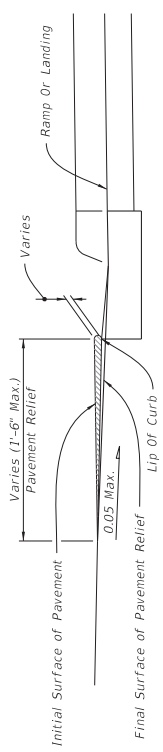




**LANDINGS FOR CURB RAMPS WITHOUT SIDEWALKS**  
(See CR-F, CR-G & CR-K Respectively For Detectable Warning Details/Options)



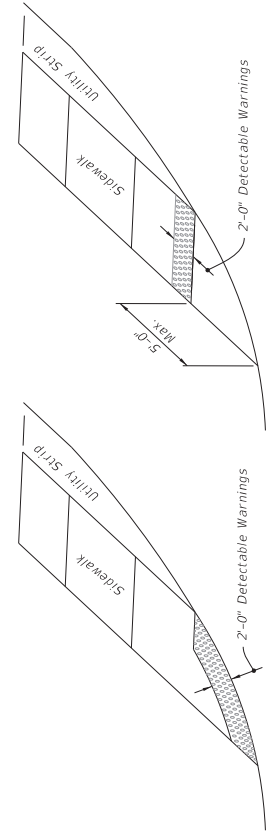
**ISOMETRIC VIEW**  
(CR-C Shown, Other Similar)



NOTE: Remove Elevated Pavement By Spading And Rolling, Smooth Milling, or Grinding.

**SECTION C-C**

**PAVEMENT RELIEF DETAILS**



**OPTION A**

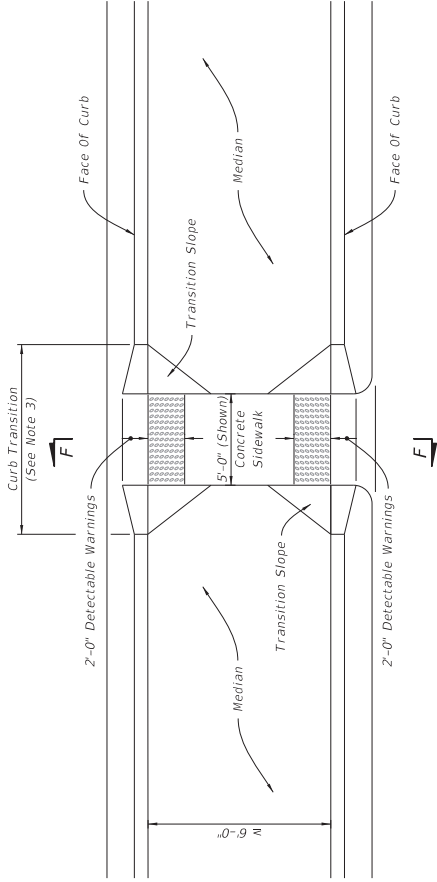
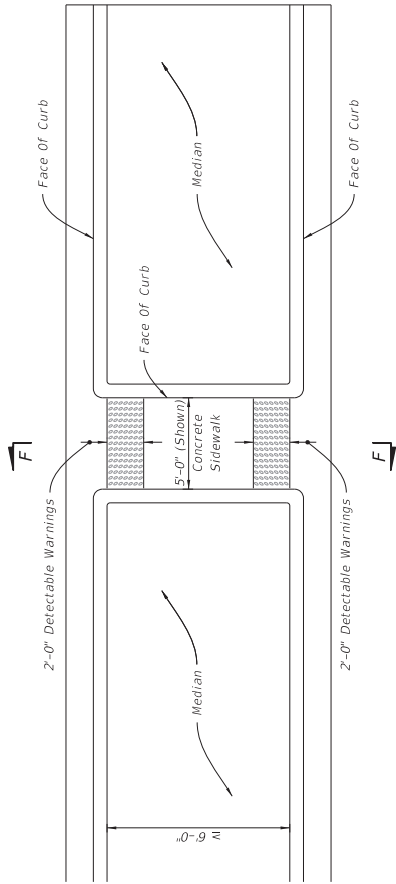
**OPTION B**

**DETECTABLE WARNING ON FLUSH SHOULDER SIDEWALKS**

**CURB RAMPS WITHOUT SIDEWALKS AND FLUSH SHOULDER SIDEWALKS**

LAST REVISION	DESCRIPTION:	FDOT	FY 2020-21 STANDARD PLANS	INDEX	SHEET
11/01/18				522-002	6 of 8





**NOTES:**

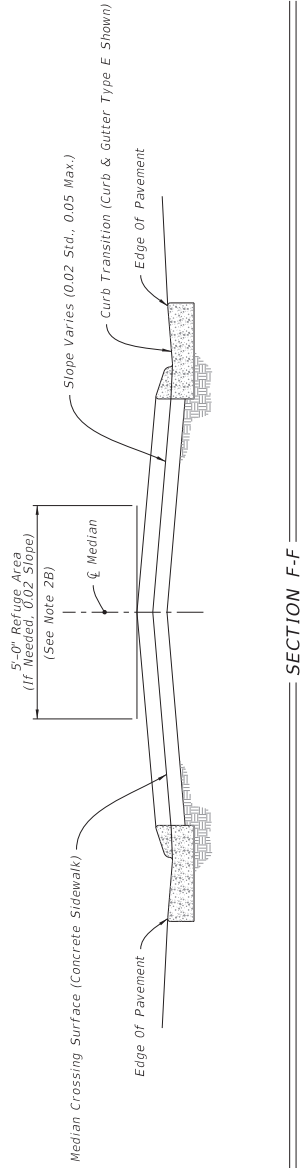
1. Cross Slope of the median crossing not to exceed 0.02.

2. Running Slopes:

A. Slopes  $\leq 0.05$ : For roadway cross sections where the Edge of Pavement elevation is the same for both directions of traffic, the median crossing running slopes (0.02 Typ.) should meet at the centerline of the median. For roadway cross sections with variable Edge of Pavement elevations, or to accommodate other construction in the median, the slopes may intersect off the centerline of the median.

B. Slopes  $> 0.05$ : Provide a median refuge area (landing, 0.02 slope) for crossings with running slopes  $> 0.05$ . The refuge area must extend the full width of the crossing and have a minimum length of 5 feet.

3. On existing facilities, remove and reconstruct curb transition for raised sidewalk with ramp.



LAST  
REVISION  
11/01/17

DESCRIPTION:

**FDOT**  
FY 2020-21  
STANDARD PLANS

DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS

INDEX

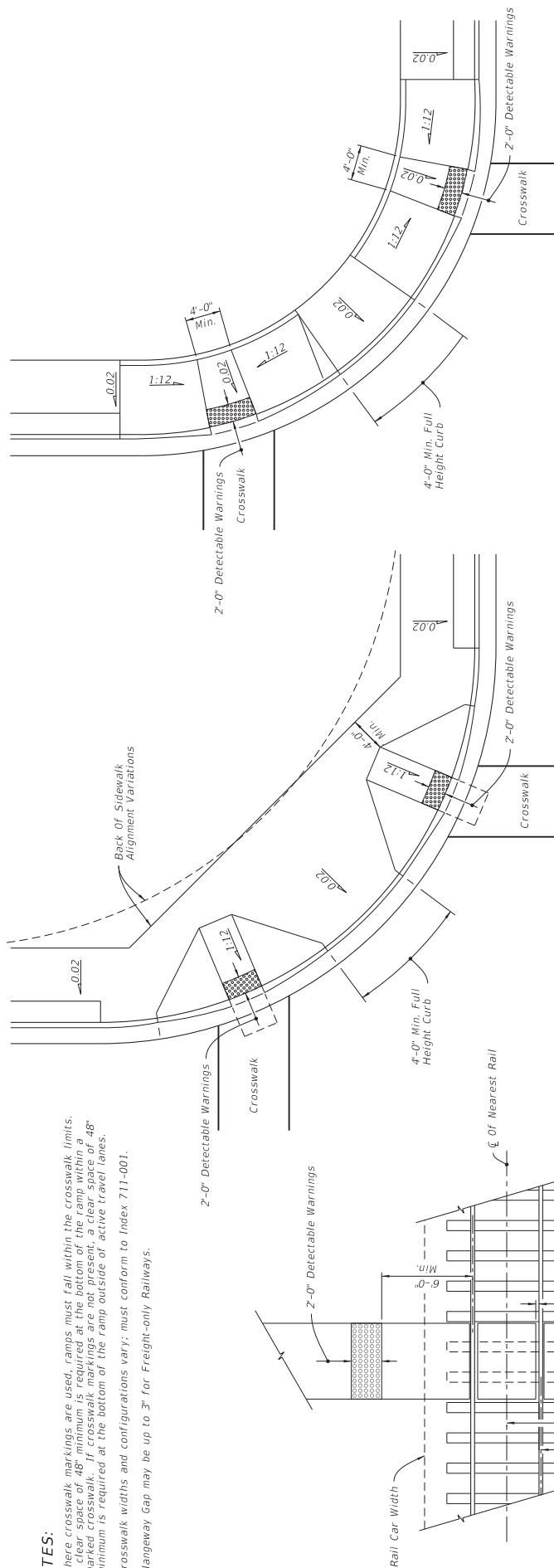
522-002

SHEET

7 of 8

MEDIAN CROSSING





## RADIAL SIDEWALK RAMPS

## LINEAR SIDEWALK RAMPS

RAILROAD CROSSING =

### PLACEMENT OF SIDEWALK CURB RAMPS AT CURBED RETURNS (TYP.)

RAILROAD CROSSING AND CURB RAMPS AT CURBED RETURNS

DESCRIPTION:

FY 2020-21  
STANDARD PLANS

DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS

INDEX	SHEET
522-002	8 of 8

SHEET  
8 of 8

NOTES:

- Where crosswalk markings are used, ramps must fall within the rampwalk limits. A clear space of 48" minimum is required at the bottom of the ramp within a marked crosswalk. If crosswalk markings are not present, a clear space of 48" minimum is required at the bottom of the ramp outside of active travel lanes.
- Crosswalk widths and configurations vary; must conform to Index 711-001.

2. Crosswalk widths and configurations vary; must conform to Index 711-001.

3. Flangeway Gap may be up to 3" for Freight-only Railways.



ALL CULVERT INVERTS, SWALE FLOWLINE GRADES  
FRONTAGE, LOCATION OF ALL R.O.W.'S AND EASEMENTS.  
ELEVATIONS, LOCATION, LENGTH AND SIZE OF ALL PIPES,  
LINES CONDUITS LOCATED IN THE RIGHT OF WAY.

ALL TOP OF BANK, BOTTOM ELEVATIONS NECESSARY TO COMPUTE STORAGE. SHOW DISTANCE BETWEEN ELEVATION SPOTS.

ALL PIPE INVERTS, WEIR BOX ELEVATIONS,  
WEIR ELEVATIONS, ETC.

FINISHED FLOOR X  
OF ALL BUILDINGS.  
CROWN OF FRONTAGE  
AND SIDE ROADS.

SUFFICIENT ELEVATION SPOTS  
TO SHOW "as-built" TOPOGRAPHY,  
AND PROPERTY LINE BOUNDARIES.

SUFFICIENT ELEVATION SPOTS TO SHOW DRAINAGE.  
ALL SIGN AND PAVEMENT MARKINGS. SET BACKS TO CURB  
CURB OR PAVEMENT. COPIES OF ALL TEST RESULTS, NOT  
RELATED TO BUILDINGS. ALL STRIPING AND SIGNING.

ALL INVERTS, INLET GRATES AND  
BOTTOM ELEVATIONS, AND SIZES.

**SWALES:**  
BEGINNING AND END BOTTOM ELEVATIONS,  
AND HIGHS ALONG FLOWLINE, TOP OF BANK  
ELEVATIONS AND LOWS ALONG TOP. DISTANCES  
BETWEEN ELEVATION SPOTS.

(N.T.S.)

X = FINAL SURVEY (AS-BUILT) INFORMATION  
NEEDED FOR ENGINEERING DIVISION INSPECTIONS  
FOR COMMERCIAL DEVELOPMENT.

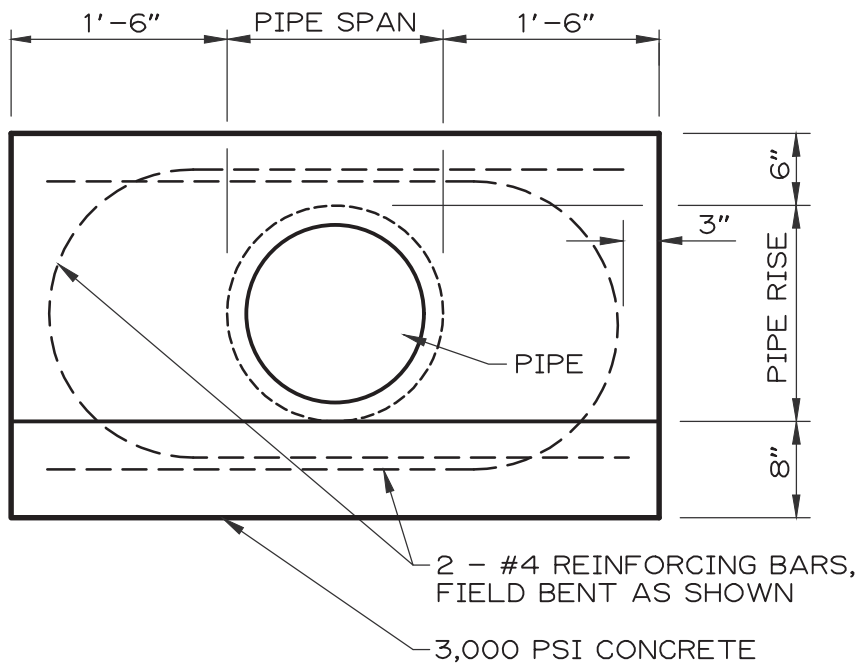


The City of **Palm Bay**, Florida

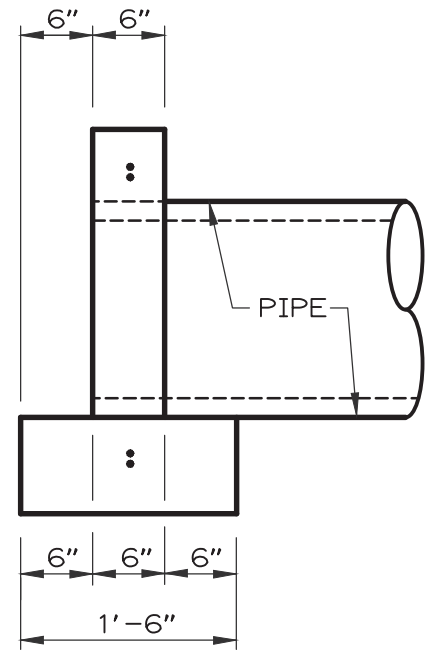
## AS-BUILT REQUIREMENTS

DATE:	7/02
DWG. NO.	





FRONT VIEW



SIDE VIEW

MODIFIED CPB HEADWALL DETAIL

SMALLER THAN 24" PIPE SPAN

(N.T.S.)



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

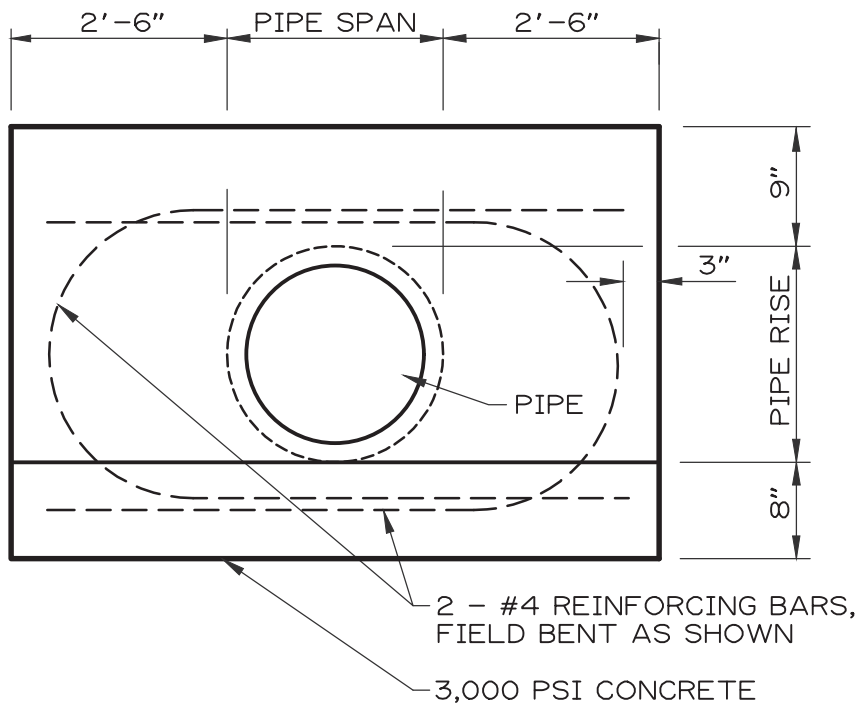
STANDARD DRAINAGE DETAIL

SD - 01

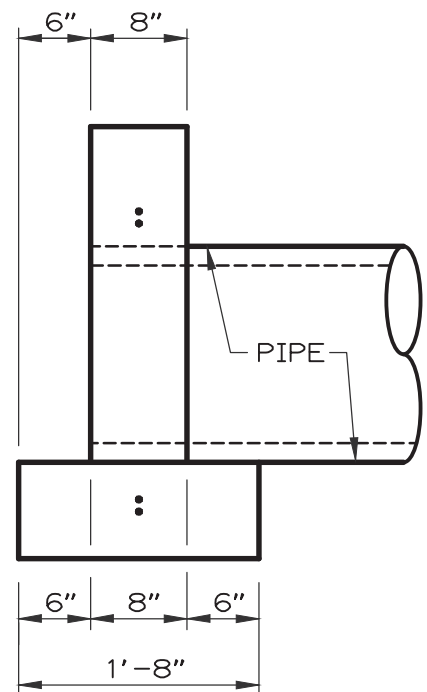
DATE: APRIL 2019

APPROVED: \_\_\_\_\_





FRONT VIEW



SIDE VIEW

**MODIFIED CPB HEADWALL DETAIL**

**24" PIPE SPAN AND LARGER**

(N.T.S.)



**CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT**

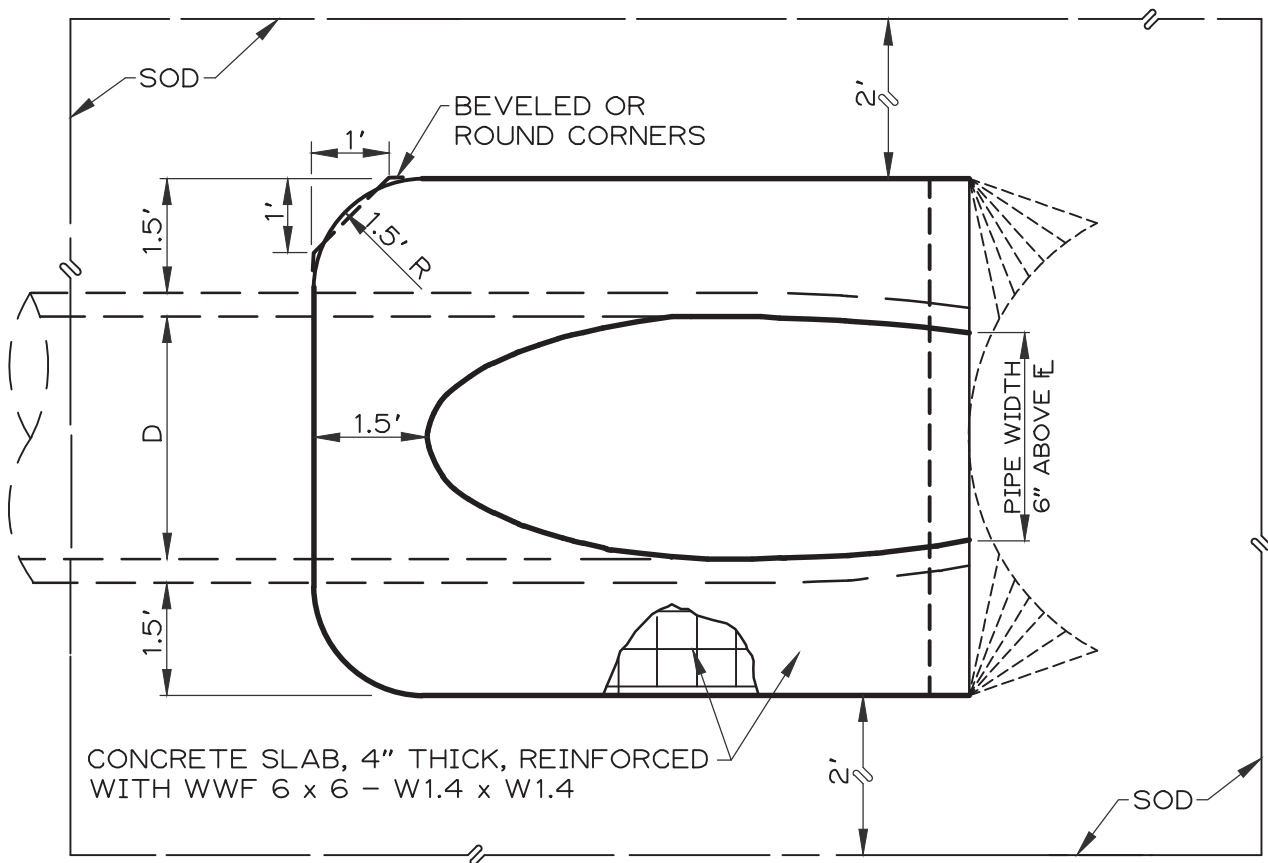
**STANDARD DRAINAGE DETAIL**

**SD - 02**

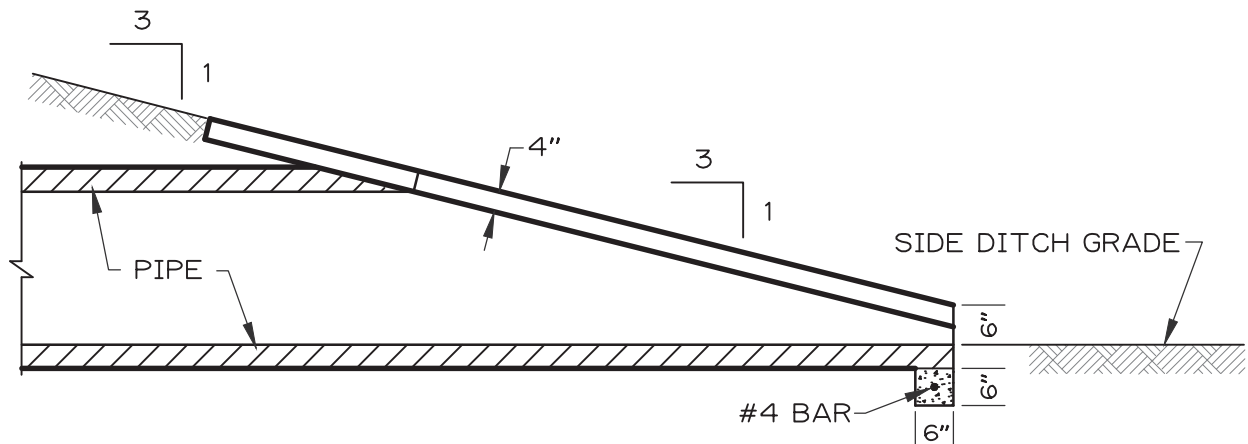
DATE: APRIL 2019

APPROVED: \_\_\_\_\_





**TOP VIEW - SINGLE PIPE**



**SECTION**

**MITERED END SECTION**

(N.T.S.)



**CITY OF PALM BAY**  
**PUBLIC WORKS DEPARTMENT**

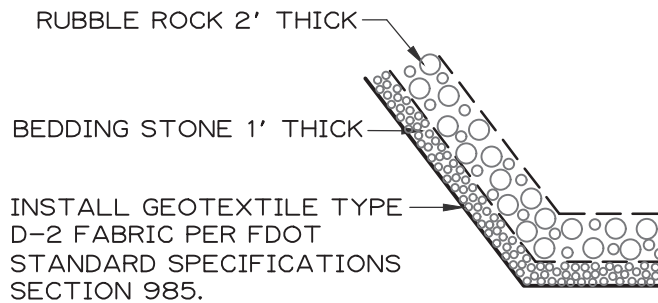
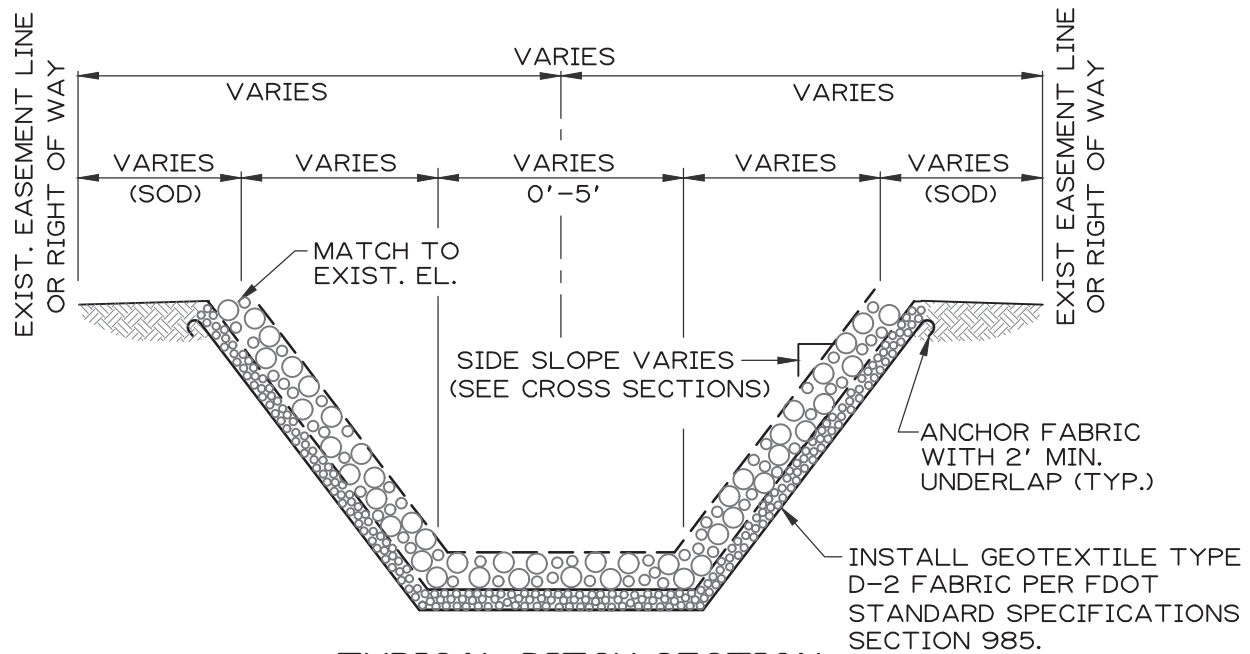
**STANDARD DRAINAGE DETAIL**

**SD - 03**

DATE: APRIL 2019

APPROVED: \_\_\_\_\_





**NOTES:**

1. GRADES SHOWN ARE FINISHED GRADES.
2. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CITY OF PALM BAY SPECIFICATIONS, AND FDOT STANDARD SPECIFICATIONS SECTION 985.
3. CONTRACTOR IS WARNED TO COORDINATE THE EXACT LOCATION OF ANY EXISTING UTILITIES WITH THE APPROPRIATE UTILITY COMPANY PRIOR TO ANY CONSTRUCTION EFFORT.
4. ANY MONUMENTS AND PUBLIC LAND CORNERS (SECTION CORNER) WITHIN THE LIMITS OF CONSTRUCTION SHALL BE PROTECTED. IF IN DANGER OF DAMAGE, THE CONTRACTOR SHALL NOTIFY THE CITY OF PALM BAY ENGINEER.
5. CONTRACTOR SHALL EXERCISE CAUTION IN WORKING NEAR PRIVATE PROPERTY. ANY PROPERTY DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED OR REPLACED TO ORIGINAL CONDITION AT THE CONTRACTORS EXPENSE.
6. ANY EXCESS EXCAVATED MATERIAL SHALL BE DISPOSED OF BY DIRECTION OF THE CITY OF PALM BAY ENGINEER.

**RIP/RAP RUBBLE FOR OPEN CHANNEL DRAINAGE DETAIL**

(N.T.S.)



**CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT**

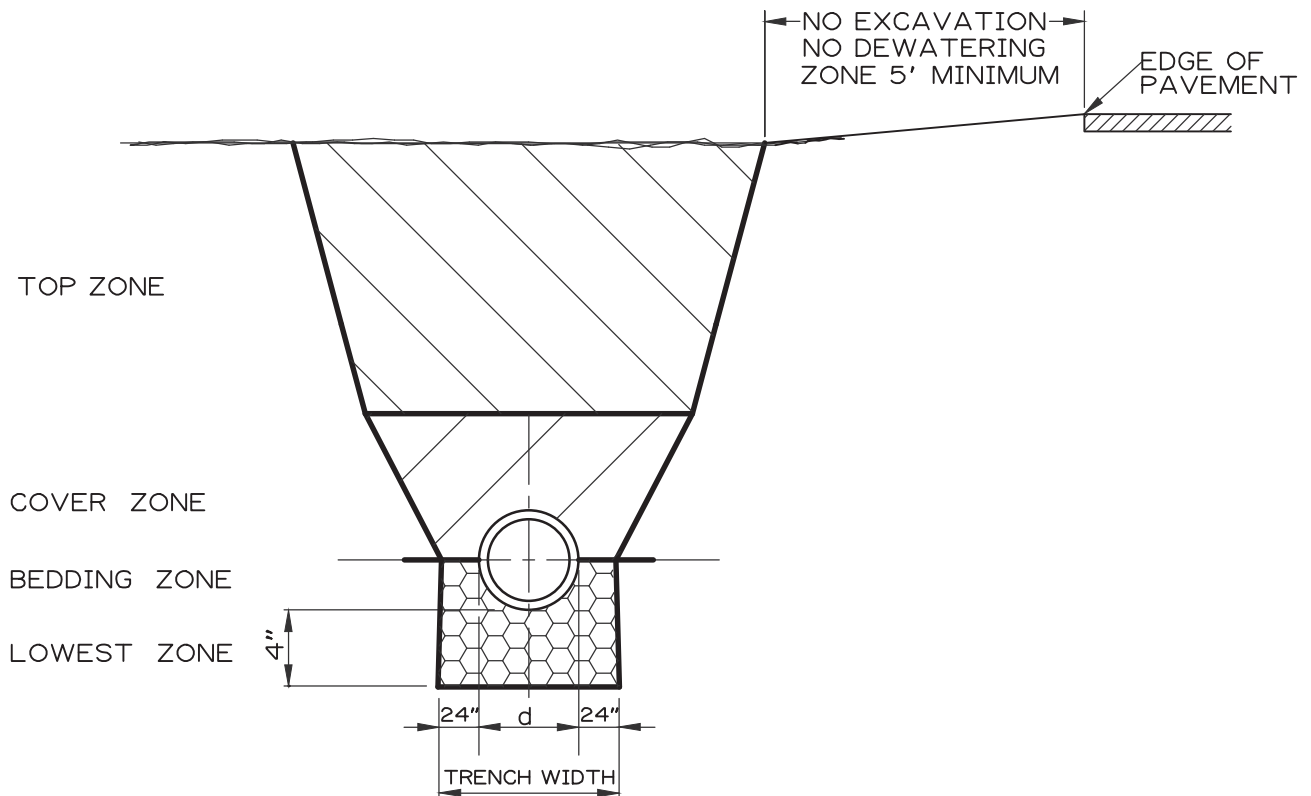
**STANDARD DRAINAGE DETAIL**

**SD - 04**

DATE: APRIL 2019

APPROVED: \_\_\_\_\_





### GENERAL NOTES:

1. WHEN PERFORMING TRENCH EXCAVATION IN EXCESS OF FIVE (5) FEET IN DEPTH, COMPLY WITH THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION'S (OSHA) TRENCH SAFETY STANDARDS, 29 C.F.R., S. 1926.650, SUBPART P, AND ALL SUBSEQUENT REVISIONS OR UPDATES ADOPTED BY THE DEPARTMENT OF LABOR AND EMPLOYMENT SECURITY. ENSURE THAT TRENCH BOXES ARE WIDE ENOUGH TO ACCOMMODATE COMPACTION AND DENSITY TESTING.
2. PERFORM ALL EXCAVATIONS IN STREAM BEDS TO A DEPTH AT LEAST FOUR (4) FEET BELOW THE PERMANENT BED OF THE STREAM, UNLESS A FIRM FOOTING CAN BE ESTABLISHED ON SOLID ROCK BEFORE SUCH DEPTH IS REACHED, AND EXCAVATE TO SUCH ADDITIONAL DEPTH AS MAY BE NECESSARY TO ELIMINATE ANY DANGER OF UNDERMINING.
3. EXCAVATE TRENCHES FOR PIPE CULVERTS TO THE ELEVATION OF THE BOTTOM OF THE PIPE AND TO A WIDTH AS NOTED IN DETAILS. REMOVE SOIL NOT MEETING THE CLASSIFICATION SPECIFIED AS SUITABLE BACKFILL MATERIAL TO A DEPTH OF FOUR (4) INCHES BELOW BOTTOM OF THE PIPE ELEVATION. REMOVE ROCK, BOULDERS OR OTHER HARD, LUMPY OR UNYIELDING MATERIALS TO A DEPTH OF TWELVE (12) INCHES BELOW THE BOTTOM OF THE PIPE ELEVATION. REMOVE MUCK OR OTHER SOFT MATERIALS TO A DEPTH NECESSARY TO ESTABLISH A FIRM FOUNDATION. WHERE THE SOILS PERMIT, ENSURE THAT THE TRENCH SIDES ARE VERTICAL UP TO AT LEAST THE MID-POINT OF THE PIPE.
4. PROVIDE NORMAL DEWATERING EQUIPMENT INCLUDING, BUT NOT LIMITED TO SURFACE PUMPS, SUMP PUMPS, WELLPOINTS AND HEADER PIPE AND TRENCHING/DIGGING MACHINERY.
5. BACKFILL TO THE ORIGINAL GROUND SURFACE OR SUBGRADE SURFACE OF OPENINGS MADE FOR STRUCTURES, WITH A SUFFICIENT ALLOWANCE FOR SETTLEMENT. DO NOT ALLOW HEAVY CONSTRUCTION EQUIPMENT TO CROSS OVER PIPE CULVERTS UNTIL PLACING AND COMPACTING BACKFILL MATERIAL TO THE FINISHED EARTHWORK GRADE OR TO AN ELEVATION AT LEAST FOUR (4) FEET ABOVE THE CROWN OF THE PIPE.

## EXCAVATION AND BACKFILL FOR STORMWATER PIPE

(N.T.S.)



**CITY OF PALM BAY**  
**PUBLIC WORKS DEPARTMENT**

**STANDARD DRAINAGE DETAIL**

**SD - 05 (1 OF 2)**

DATE: APRIL 2019

APPROVED: \_\_\_\_\_



(CONT. FROM SHEET 1)

**GENERAL NOTES:**

6. PLACE THE MATERIAL IN HORIZONTAL LAYERS NOT EXCEEDING SIX (6) INCHES COMPACTED THICKNESS, IN DEPTH ABOVE WATER LEVEL, BEHIND ABUTMENTS, WINGWALLS AND END BENTS, UNDER THE HAUNCHES OF THE PIPES AND AROUND BOX CULVERTS AND ALL STRUCTURES INCLUDING PIPE CULVERTS. THE CONTRACTOR MAY ELECT TO PLACE MATERIAL IN THICKER LIFTS OF NO MORE THAN TWELVE (12) INCHES COMPACTED THICKNESS OUTSIDE THE SOIL ENVELOPE IF HE/SHE CAN DEMONSTRATE WITH THE SUCCESSFUL TEST SECTION THAT DENSITY CAN BE ACHIEVED.
7. MATERIAL:
  - A) LOWEST ZONE: BACKFILL AREAS UNDERCUT BELOW THE BEDDING ZONE OF A PIPE WITH COURSE SAND, OR OTHER SUITABLE GRANULAR MATERIAL, OBTAINED FROM THE GRADING OPERATIONS ON THE PROJECT, OR A COMMERCIAL MATERIAL IF NO SUITABLE MATERIAL IS AVAILABLE. TWELVE (12) INCHES BELOW THE BOTTOM OF THE PIPE ELEVATION, REMOVE MUCK OR OTHER SOFT MATERIALS TO A DEPTH NECESSARY TO ESTABLISH A FIRM FOUNDATION. WHERE THE SOILS PERMIT, ENSURE THAT THE TRENCH SIDES ARE VERTICAL UP TO AT LEAST THE MID-POINT OF THE PIPE.
  - B) SOIL ENVELOPE: IN BOTH THE BEDDING ZONE AND THE COVER ZONE OF THE PIPE, BACKFILL WITH MATERIALS CLASSIFIED AS A-1, A-2 OR A-3. MATERIAL CLASSIFIED AS A-4 MAY BE USED IF THE PIPE IS CONCRETE PIPE.
  - C) TOP ZONE: BACKFILL THE AREA OF THE TRENCH ABOVE THE SOIL ENVELOPE OF THE PIPE WITH MATERIALS CLASSIFIED AS A-1 OR A-3. WHEN PIPE IS UNDER ROADWAY, BACKFILL TO BOTTOM OF ROADWAY SUBGRADE. SUBGRADE AND MATERIAL SHALL BE IN ACCORDANCE WITH PLANS.
8. COMPACTION:
  - A) LOWEST ZONE: COMPACT THE SOIL IN THE LOWEST ZONE TO APPROXIMATELY MATCH THE DENSITY OF THE SOIL IN WHICH THE TRENCH WAS CUT.
  - B) BEDDING ZONE: IF THE TRENCH WAS NOT UNDERCUT BELOW THE BOTTOM OF THE PIPE, LOOSEN THE SOIL IN THE BOTTOM OF THE TRENCH IMMEDIATELY BELOW THE APPROXIMATE MIDDLE THIRD OF THE OUTSIDE DIAMETER OF THE PIPE. IF THE TRENCH WAS UNDERCUT, PLACE THE BEDDING MATERIAL AND LEAVE IT IN A LOOSE CONDITION BELOW THE MIDDLE THIRD OF THE OUTSIDE DIAMETER OF THE PIPE. COMPACT THE MATERIAL TO 100% MAXIMUM DENSITY PER AASHTO T-99 METHOD C. PLACE THE MATERIAL IN LIFTS NO GREATER THAN SIX (6) INCHES (COMPACTED THICKNESS).
  - C) COVER ZONE: BEFORE PLACING THE COVER ZONE MATERIAL, LAY PIPE ACCORDING TO ALIGNMENT AND GRADES GIVEN. DO NOT ALLOW DEPARTURE FROM ALIGNMENT OR GRADE TO EXCEED 1/16 PER FOOT OF NOMINAL PIPE LENGTH. TAKE UP AND RE-LAY ANY PIPE THAT IS NOT TRUE TO ALIGNMENT OR WHICH SHOWS SETTLEMENT AFTER LAYING. EXCAVATE FOR PIPE BELLS BEFORE LAYING PIPE. PLACE THE MATERIAL IN SIX (6) INCH LAYERS (COMPACTED THICKNESS), EVENLY DEPOSITED ON BOTH SIDES OF THE PIPE, AND COMPACT WITH MECHANICAL TAMPERS SUITABLE FOR THIS PURPOSE. HAND TAMP MATERIAL BELOW THE PIPE HAUNCH THAT CANNOT BE REACHED BY MECHANICAL TAMPERS. COMPACT THE MATERIAL TO 98% MAXIMUM DENSITY PER AASHTO T-99 METHOD C.
  - D) TOP ZONE: PLACE THE MATERIAL IN LAYERS NOT TO EXCEED TWELVE (12) INCHES IN COMPACTED THICKNESS. COMPACT THE MATERIAL TO 95% MAXIMUM DENSITY PER AASHTO T-99 METHOD C FOR OUTSIDE OF ROADWAY, 98% FOR UNDER THE ROADWAY.
9. BACKFILL UNDER WET CONDITIONS: WHERE WET CONDITIONS ARE SUCH THAT DEWATERING BY NORMAL PUMPING METHODS WOULD NOT BE EFFECTIVE, THE USE OF COARSE AGGREGATE BELOW THE ELEVATION AT WHICH MECHANICAL TAMPERS WOULD BE EFFECTIVE WOULD BE ACCEPTABLE. USE COARSE AGGREGATE AS SPECIFIED IN FDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION SECTION 901 FOR AGGREGATE SIZE NUMBER 89, 8, 78, 7, 68, 6 OR 57. PLACE THE COARSE AGGREGATE SUCH THAT IT WILL BE STABLE AND FIRM. FULLY WRAP THE AGGREGATE WITH A LAYER OF TYPE D-4 FILTER FABRIC, AS SPECIFIC IN FDOT STANDARD SPECIFICATIONS SECTION 985. DO NOT PLACE COARSE AGGREGATE WITHIN FOUR (4) FEET OF THE ENDS OF THE TRENCH OR DITCH. USE NORMALLY ACCEPTED BACKFILL MATERIAL AT THE ENDS.



**CITY OF PALM BAY**  
**PUBLIC WORKS DEPARTMENT**

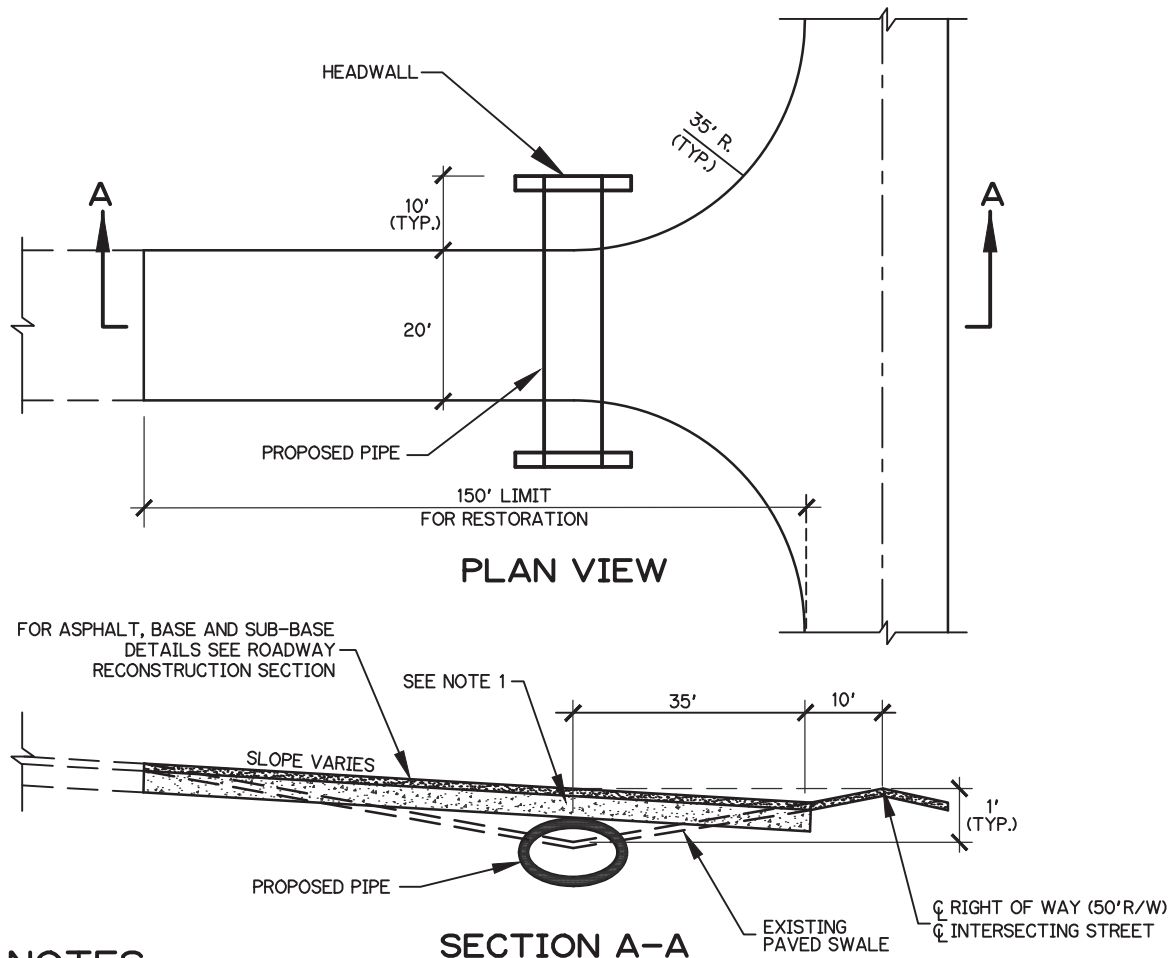
**STANDARD DRAINAGE DETAIL**

**SD - 05 (2 OF 2)**

DATE: APRIL 2019

APPROVED: \_\_\_\_\_





## NOTES

1. DEPTH OF BASE OVER TOP OF PIPE SHALL BE 8" MINIMUM. IF DESIRED DEPTH CAN NOT BE MET, SEE CONCRETE ARMORED DETAIL.
2. PIPE INSTALLATION SHALL BE PLACED ON 8" MINIMUM COMPACTED SOIL BACKFILL IF THE EXPOSED MATERIAL IS UNSUITABLE OR DISTURBED. THE PIPE BED BACKFILL SOIL SHALL BE COMPACTED TO 98% MAXIMUM DENSITY, AS PER AASHTO T-180 D METHOD. 3/4" ROCK GRAVEL, NUMBER 57 STONE, CLEAN NATURAL SAND, IMPORTED QUARRY WASTE OR MIXTURE THEREOF MAY BE USED AS AN ALTERNATIVE TO COMPACTED SOIL. SAMPLES OF THE MATERIAL SHALL BE SUBMITTED SUFFICIENTLY IN ADVANCED OF THE INTENDED USE TO ENABLE INSPECTION, TESTING AND APPROVAL OR REJECTION THEREOF.
3. BACKFILL SOIL SHALL BE COMPACTED IN MAXIMUM 12" LAYERS 98% MAXIMUM DENSITY, AS AASHTO T-180 D METHOD. IN PLACE DENSITY TESTS SHALL BE IN ACCORDANCE WITH AASHTO T 310-06 METHOD. COMPACTION SHALL BE ACCOMPLISHED BY SUITABLE EQUIPMENT SPECIFICALLY DESIGNED FOR THIS PURPOSE.
4. TYPICAL PIPE SIZES TO BE 12"x18" RCP, 14"x23" RCP, 19"x30" RCP & 24"x38" RCP.
5. PIPE INVERTS TO BE 1.5' MINIMUM BELOW CENTERLINE OF THE INTERSECTING STREET. FINAL CULVERT GRADE TO BE SUPPLIED BY THE CITY OF PALM BAY STAFF. STAKING OF GRADES TO BE SUPPLIED BY OTHERS

## TYPICAL CULVERT INSTALLATION W/HDWL AND INTERSECTION DETAIL

(N.T.S.)



**CITY OF PALM BAY**  
**PUBLIC WORKS DEPARTMENT**

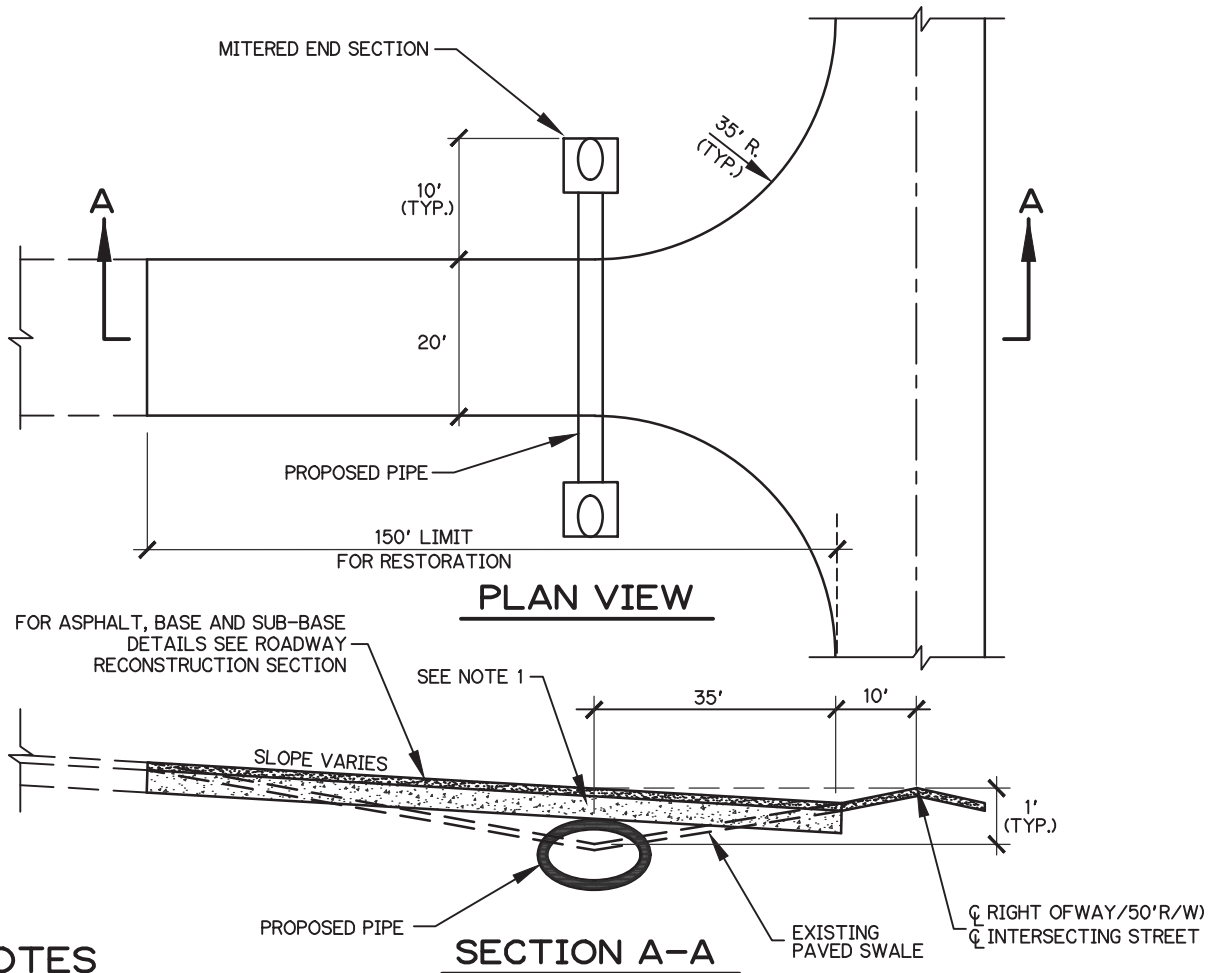
**STANDARD DRAINAGE DETAIL**

**SD - 06**

DATE: APRIL 2019

APPROVED: \_\_\_\_\_





## NOTES

1. DEPTH OF BASE OVER TOP OF PIPE SHALL BE 8" MINIMUM. IF DESIRED DEPTH CAN NOT BE MET, SEE CONCRETE ARMORED DETAIL.
2. PIPE INSTALLATION SHALL BE PLACED ON 8" MINIMUM COMPACTED SOIL BACKFILL IF THE EXPOSED MATERIAL IS UNSUITABLE OR DISTURBED. THE PIPE BED BACKFILL SOIL SHALL BE COMPACTED TO 98% MAXIMUM DENSITY, AS PER AASHTO T-180 D METHOD. 3/4" ROCK GRAVEL, NUMBER 57 STONE, CLEAN NATURAL SAND, IMPORTED QUARRY WASTE OR MIXTURE THEREOF MAY BE USED AS AN ALTERNATIVE TO COMPACTED SOIL. SAMPLES OF THE MATERIAL SHALL BE SUBMITTED SUFFICIENTLY IN ADVANCED OF THE INTENDED USE TO ENABLE INSPECTION, TESTING AND APPROVAL OR REJECTION THEREOF.
3. BACKFILL SOIL SHALL BE COMPACTED IN MAXIMUM 12" LAYERS 98% MAXIMUM DENSITY, AS AASHTO T-180 D METHOD. IN PLACE DENSITY TESTS SHALL BE IN ACCORDANCE WITH AASHTO T 310 -06 METHOD. COMPACTION SHALL BE ACCOMPLISHED BY SUITABLE EQUIPMENT SPECIFICALLY DESIGNED FOR THIS PURPOSE.
4. TYPICAL PIPE SIZES TO BE EITHER 12"x18" RCP, 14"x23" RCP , 19"x30" RCP & 24"x38" RCP.
5. PIPE INVERTS TO BE 1.5' MINIMUM BELOW CENTERLINE OF THE INTERSECTING STREET. FINAL CULVERT GRADE TO BE SUPPLIED BY THE CITY OF PALM BAY STAFF. STAKING OF GRADES TO BE SUPPLIED BY OTHERS

## TYPICAL CULVERT INSTALLATION W/MES AND INTERSECTION DETAIL

(N.T.S.)



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

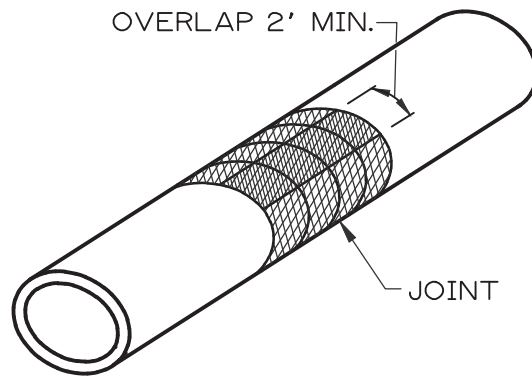
STANDARD DRAINAGE DETAIL

SD - 07

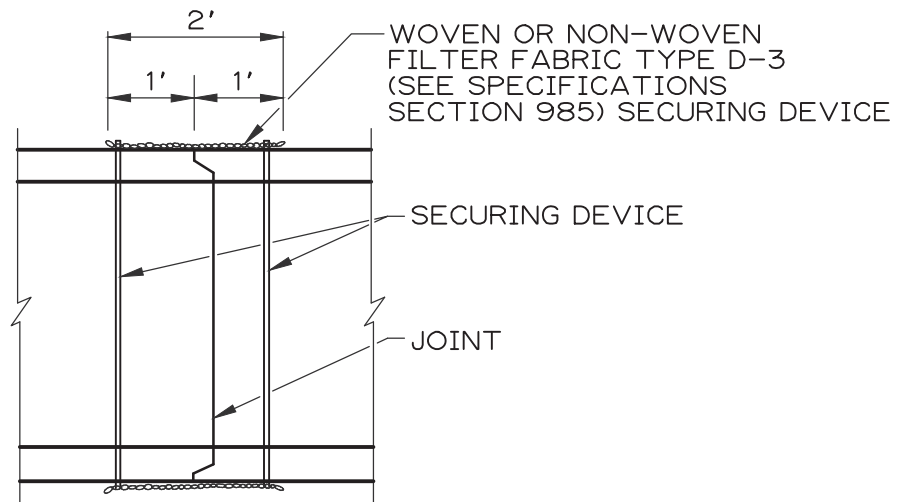
DATE: APRIL 2019

APPROVED: \_\_\_\_\_





(ELLIPTICAL PIPE SHOWN)  
**ISOMETRIC VIEW**



**PIPE SECTION**

**FILTER FABRIC JACKET**  
 (FOR ALL PIPE – CONCRETE PIPE SHOWN)

**FDOT #280 – FILTER FABRIC JACKET**  
 (N.T.S.)



**CITY OF PALM BAY**  
**PUBLIC WORKS DEPARTMENT**

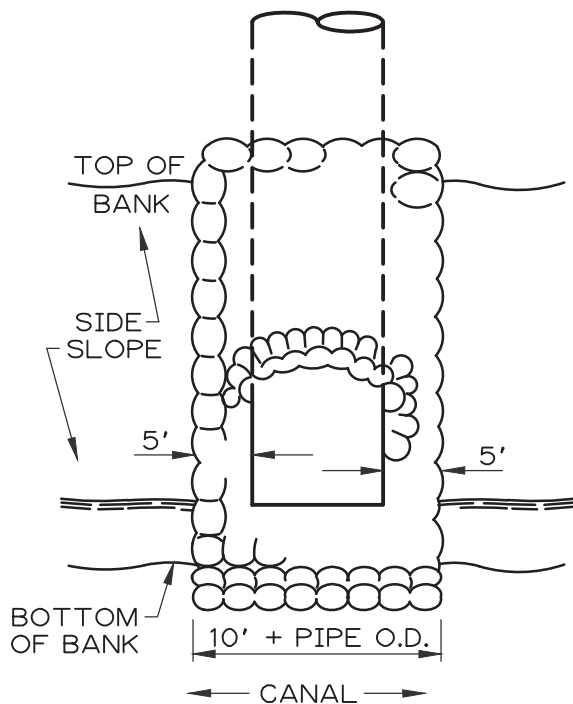
**STANDARD DRAINAGE DETAIL**

**SD – 08**

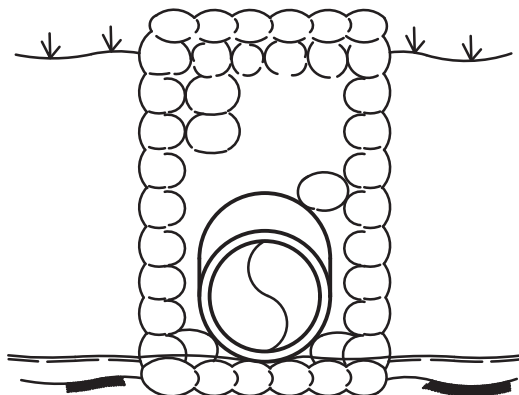
DATE: APRIL 2019

APPROVED: \_\_\_\_\_

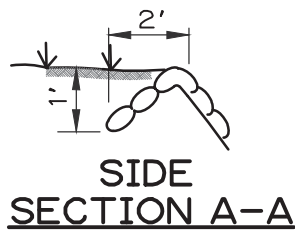




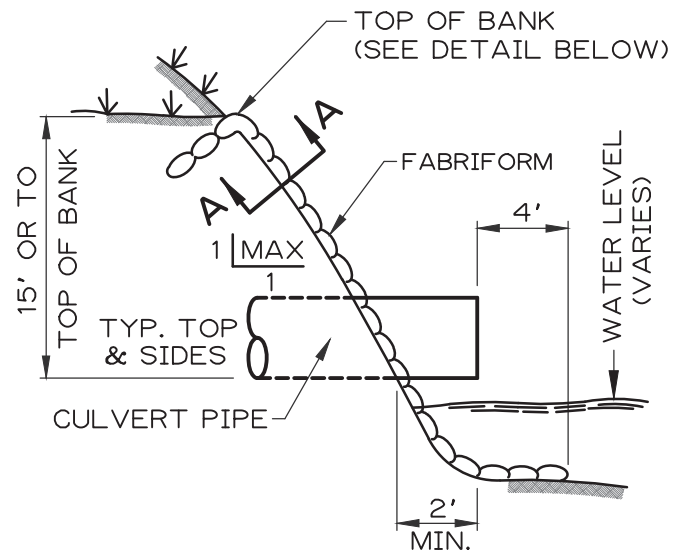
**PLAN**



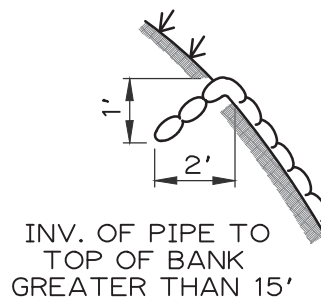
**FRONT**



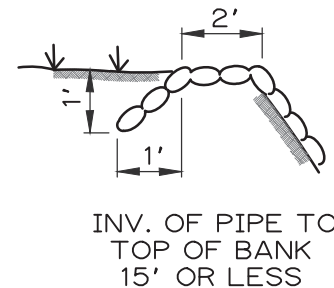
**SIDE SECTION A-A**



**SIDE**



INV. OF PIPE TO TOP OF BANK  
GREATER THAN 15'



INV. OF PIPE TO TOP OF BANK  
15' OR LESS

**BANK SECTION**

**NOTES:**

1. PRODUCT - FABRIFORM (OR EQUAL).
2. USE 8" FILLER POINT.
3. CONCRETE AND INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
4. SOD 5' AROUND ENDWALL.

**FABRIFORM ENDWALL DETAIL**

(N.T.S.)



**CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT**

**STANDARD DRAINAGE DETAIL**

**SD - 09**

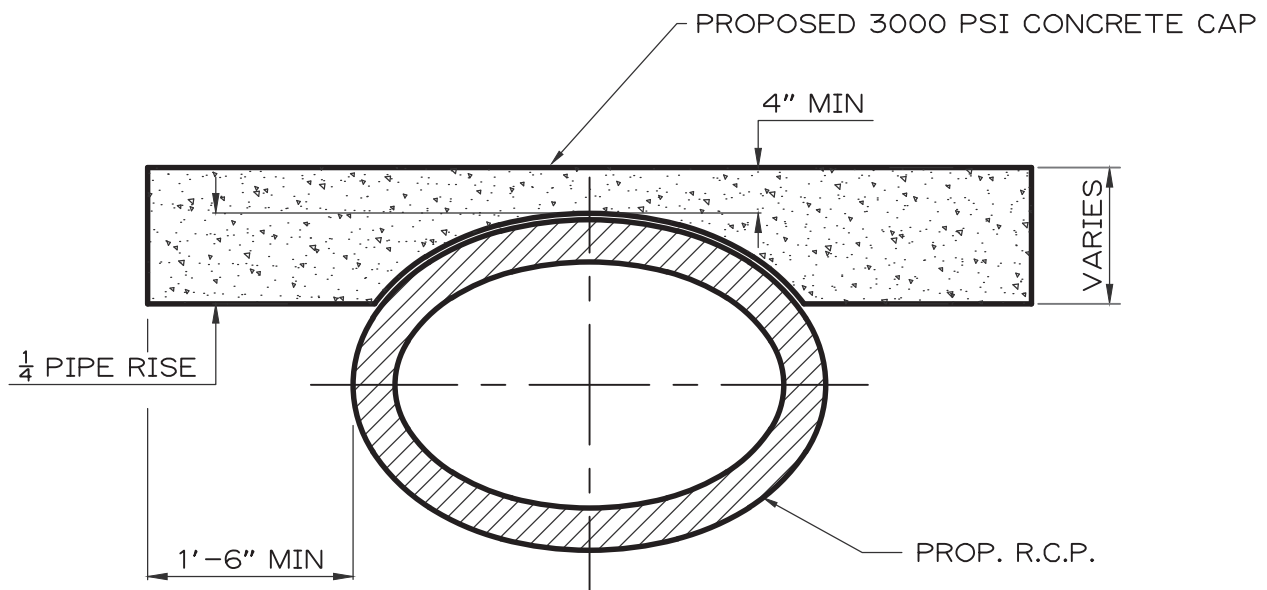
DATE: APRIL 2019

APPROVED: \_\_\_\_\_









## CONCRETE ARMORED DETAIL

(N.T.S.)



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

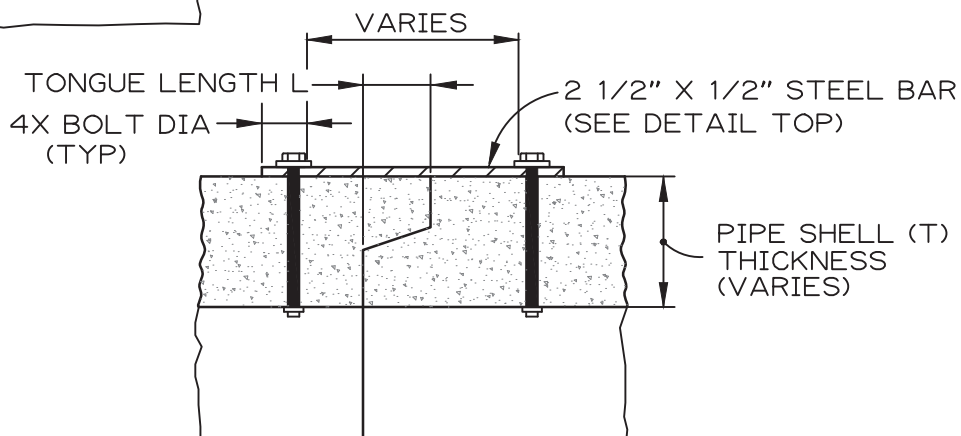
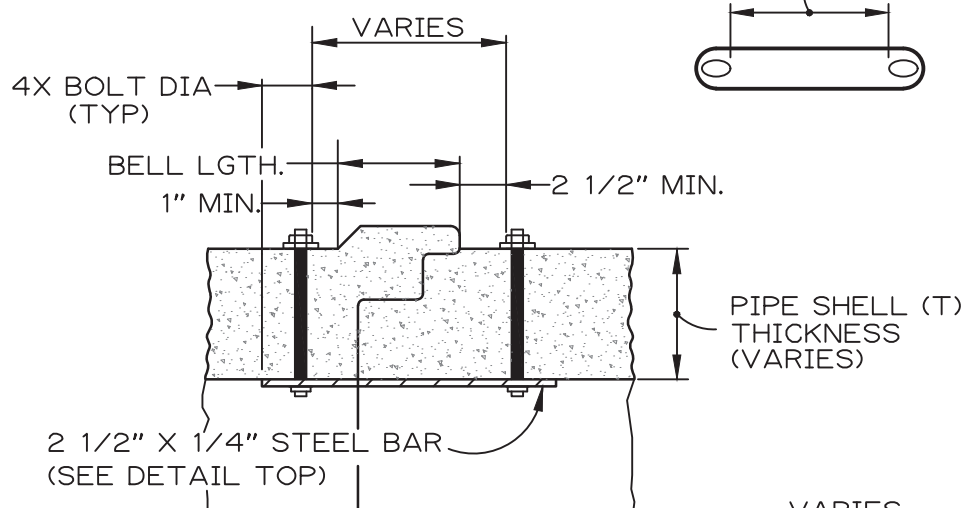
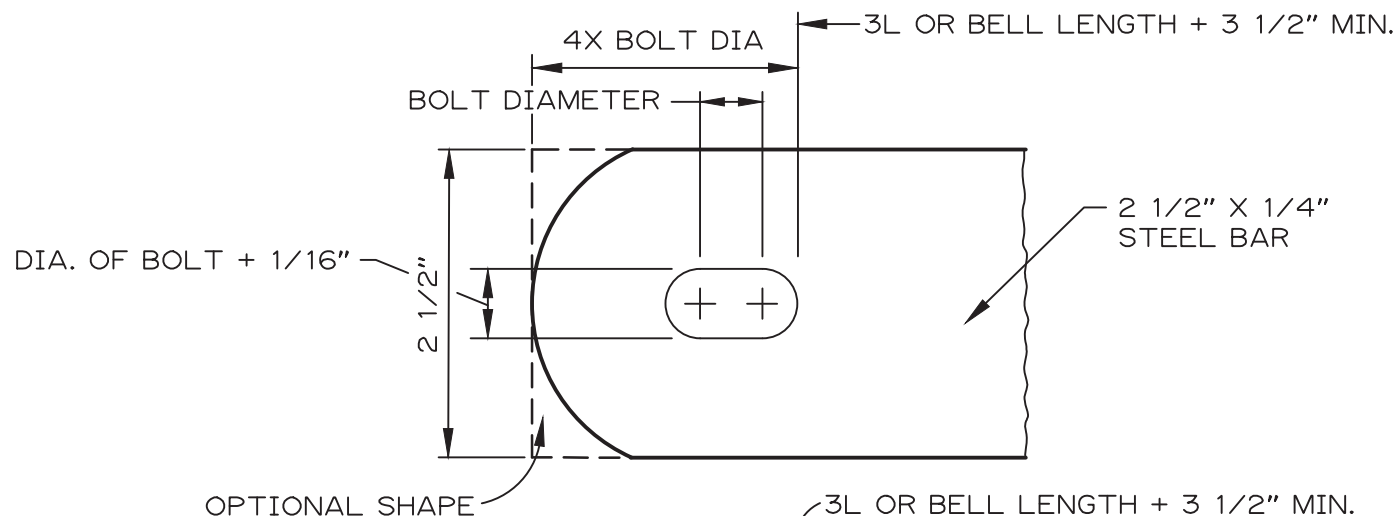
STANDARD DRAINAGE DETAIL

SD - 11

DATE: APRIL 2019

APPROVED: \_\_\_\_\_





**NOTE:**

1. ALL BARS, BOLTS, NUTS AND WASHERS ARE TO BE GALVANIZED STEEL. BOLT DIAMETERS SHALL BE 3/8" FOR 15" TO 36" PIPE AND 5/8" FOR 42" TO 72" PIPE. TWO CONNECTORS REQUIRED PER JOINT, LOCATED 60° RIGHT AND LEFT OF BOTTOM CENTER OF PIPE. BOLT HOLES IN PIPE SHELL ARE TO BE DRILLED.
2. REQUIRED FOR PIPES ENTERING WET PONDS.

## CONCRETE PIPE CONNECTOR DETAIL



**CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT**

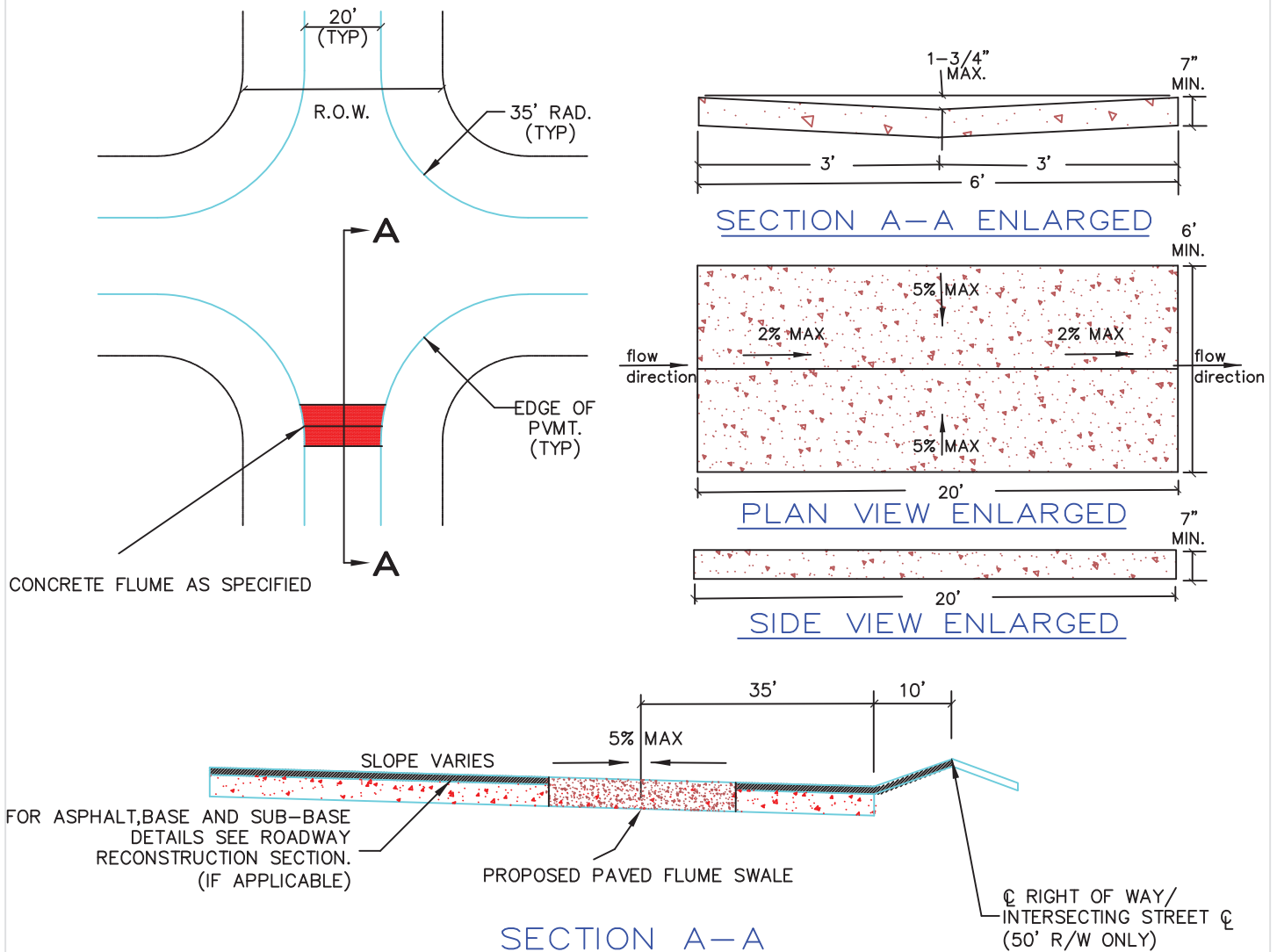
**STANDARD DRAINAGE DETAIL**

**SD-12**

DATE: APRIL 2019

APPROVED: \_\_\_\_\_





#### GENERAL NOTES

- Flume installation shall be placed on 8" minimum compacted backfill if the exposed material is unsuitable or disturbed.
- Limerock (or coquina) backfill to be compacted to 98% Maximum Density, as per AASHTO-T 180 D method adjacent to flume.
- Base shall be reconstructed 6" outside of edge of pavement.
- In place density tests shall be in accordance with AASHTO-T 310-06 method.
- Density test shall be accepted on stabilized non yielding surfaces only.
- Other conditions may apply, refer to the Palm Bay Code of Ordinance.
- Actual repair width shall be as wide as necessary to provide neat sawcut lines at right angles to pavement centerline.
- Asphaltic pavement shall be Type SP9.5 or Type SP12.5 (F.D.O.T.) 1.5" minimum or consistent with existing pavement thickness (whichever is greater) and shall be installed on a continuous plane without humps or depressions.
- Concrete flume shall be 3,000PSI concrete with fibermesh reinforcement expansion and contraction joints 10ft on center. Dimension of flume is 20Lx6wx7"t

## TYPICAL FLUME INSTALLATION AND INTERSECTION DETAIL

(N.T.S.)



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

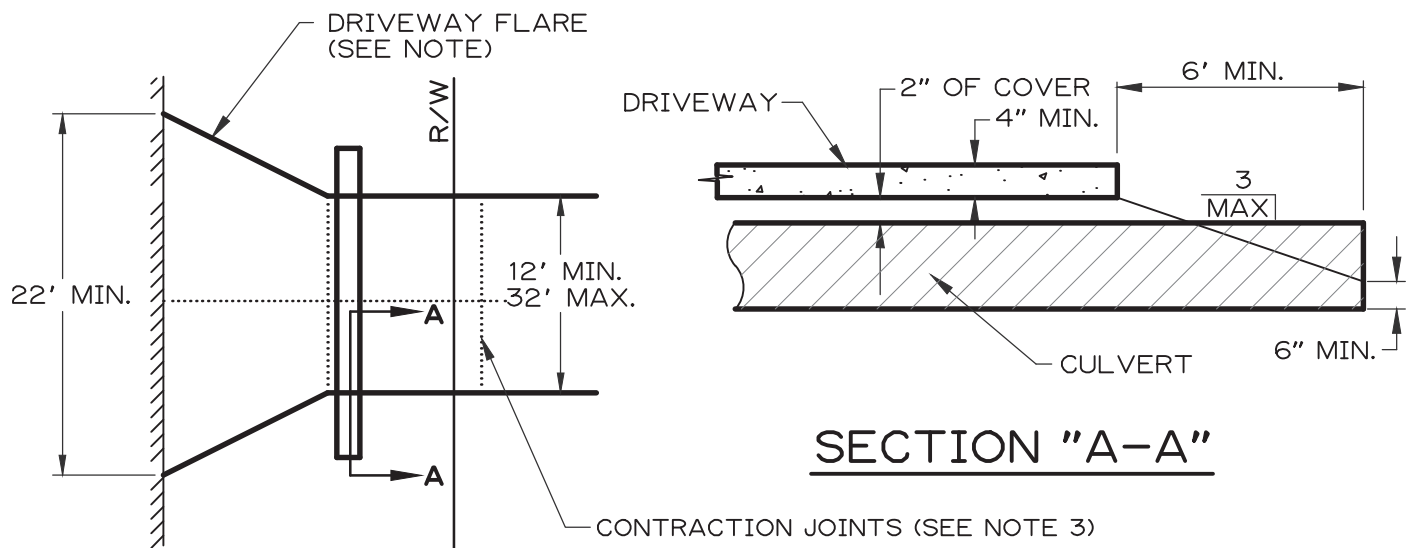
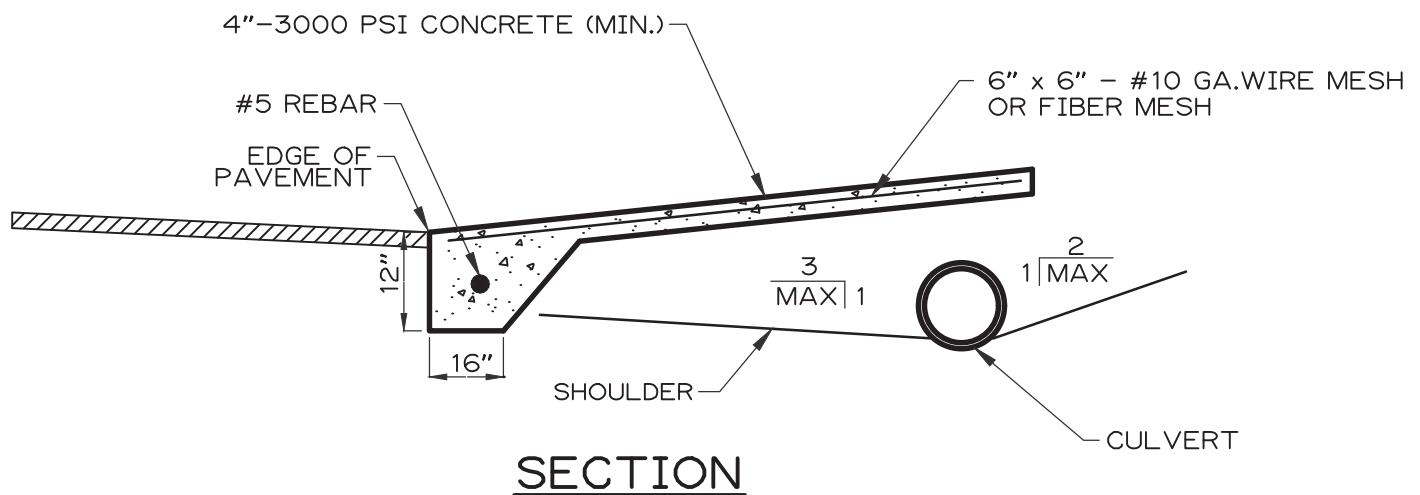
STANDARD DRAINAGE DETAIL

SD - FLUME

DATE: FEB 2022

APPROVED: \_\_\_\_\_





**NOTES:**

1. REPLACEMENT OF EXISTING DRIVE APRONS SHALL BE TO DIMENSIONS SHOWN OR TO MATCH THAT OF EXISTING.
2. DRIVEWAY FLARES ARE TO BE 5' TAPERED BACKWARD 10' FOR 12' WIDE DRIVES. 3' TAPERED BACKWARD 8' FOR 16' WIDE DRIVES OR LARGER.
3. DRIVEWAY CONTRACTION JOINTS (CONTROL JOINTS) PER ACI SECTION 5.5.2 REQUIRED.

**CULVERT PIPE AND DRIVEWAY RESTORATION DETAIL**



**CITY OF PALM BAY**  
**PUBLIC WORKS DEPARTMENT**

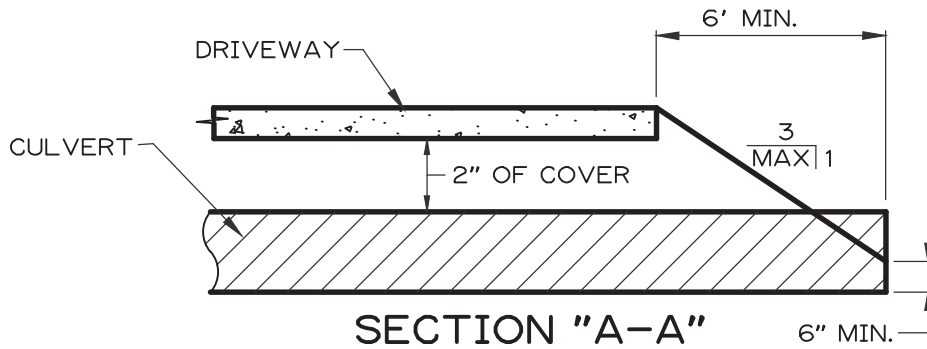
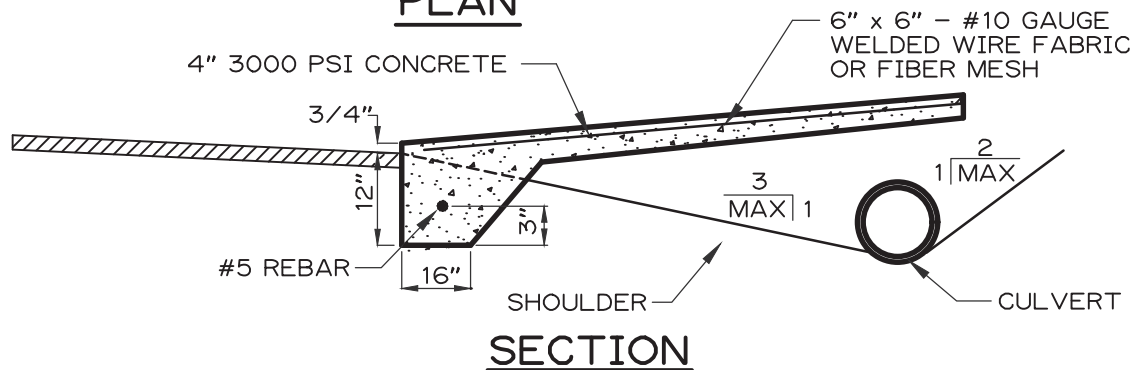
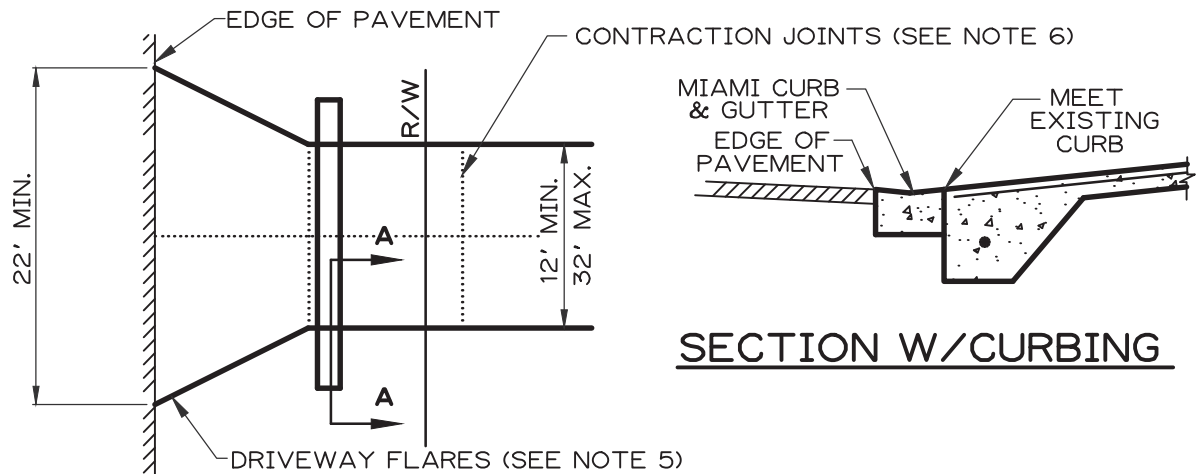
**STANDARD DRIVEWAY DETAIL**

**SDW - 01**

DATE: APRIL 2019

APPROVED: \_\_\_\_\_





#### NOTES:

1. ALL CONSTRUCTION SHALL CONFORM TO THE CITY OF PALM BAY STANDARDS AND SPECIFICATIONS.
2. IN CITY RIGHT- OF- WAYS, A DRIVEWAY PERMIT SHALL BE REQUIRED. CULVERT SIZE, LOCATION, AND INVERT INFORMATION WILL BE PROVIDED BY THE RIGHT- OF- WAY SERVICES DIVISION. STATE OR COUNTY PERMITS SHALL BE REQUIRED IF WITHIN THOSE RIGHT- OF- WAYS.
3. EXISTING SIDEWALKS AND BIKE PATHS SHALL NOT BE CHANGED IN ANY MANNER EITHER IN LOCATION OR ELEVATION, UNLESS OTHERWISE SPECIFIED.
4. LENGTH OF CULVERT PIPE IF NOT SPECIFIED SHALL BE A MINIMUM OF 24'. FOR DRIVEWAY WIDTHS IN EXCESS OF 12', CULVERT PIPE SHALL EXTEND BEYOND DRIVEWAY AS REQUIRED.
5. DRIVEWAY FLARES ARE TO BE 5' WIDE TAPERED BACK 10' FOR 12' WIDE DRIVES. DRIVEWAY FLARES ARE TO BE 3' WIDE TAPERED BACK 8' FOR 16' WIDE DRIVES OR LARGER.
6. DRIVEWAY CONTRACTION JOINTS (CONTROL JOINTS) PER ACI SECTION 5.5.2 REQUIRED.

### **RESIDENTIAL CULVERT PIPE AND DRIVEWAY DETAIL**

(N.T.S.)



**CITY OF PALM BAY**  
**PUBLIC WORKS DEPARTMENT**

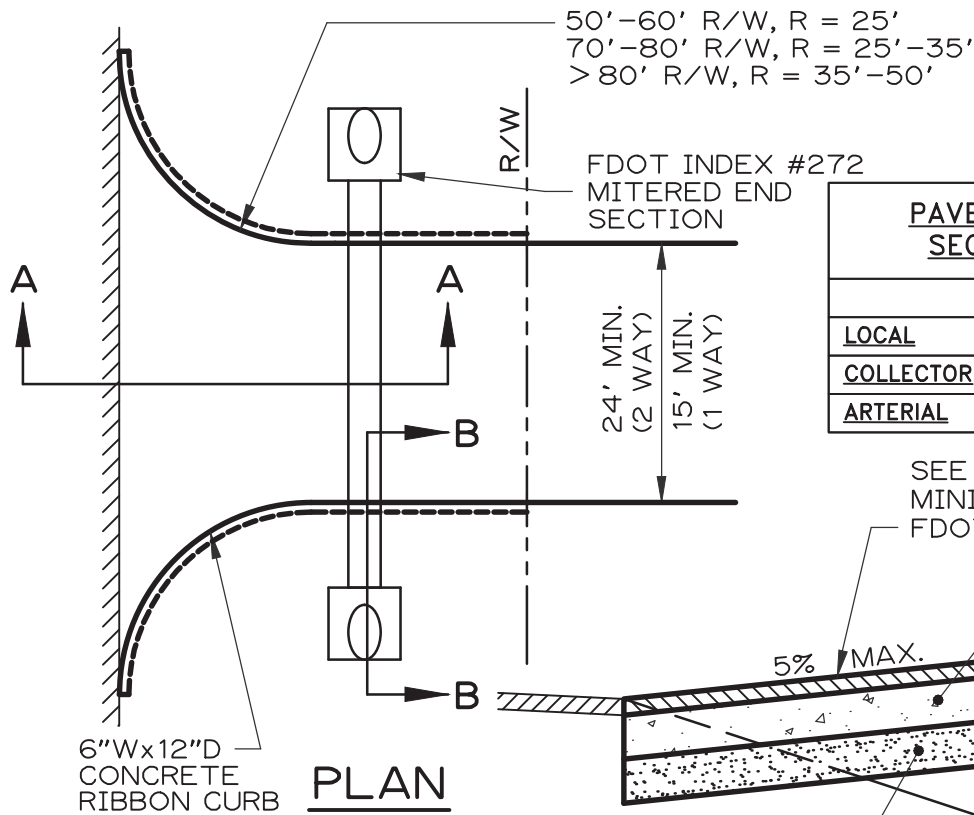
**STANDARD DRIVEWAY DETAIL**

**SDW - 02**

DATE: APRIL 2019

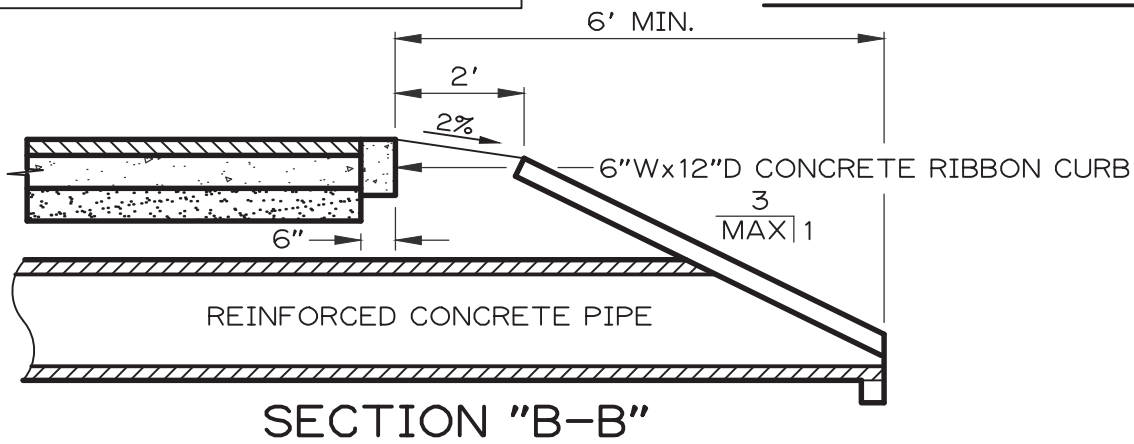
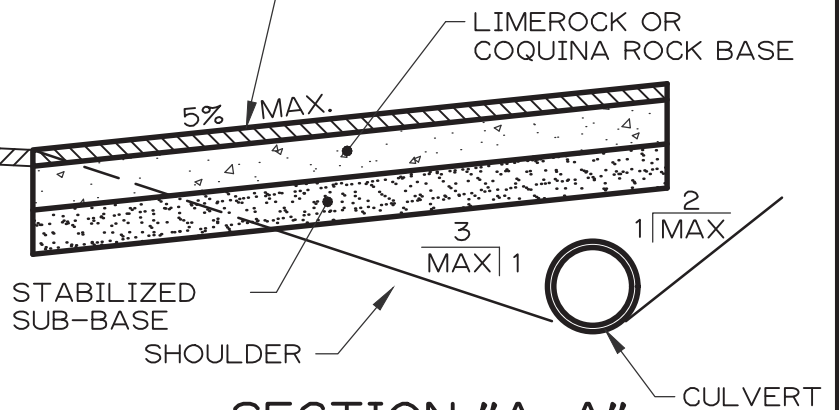
APPROVED: \_\_\_\_\_





PAVEMENT CROSS SECTION TABLE			TYPE S-1 OR TYPE S-III ASPHALT
	SUB-BASE	BASE	SURFACE
LOCAL	8"	8"	1-1/2"
COLLECTOR	10"	10"	2"
ARTERIAL	10"	12"	3"

SEE TABLE ABOVE FOR MINIMUM REQUIREMENTS  
FDOT S-1 OR S-III ASPHALT



**NOTE:**

1. REPLACEMENT OF EXISTING DRIVEWAY APRONS SHALL BE TO DIMENSIONS SHOWN OR TO MATCH THAT OF EXISTING.
2. IN CITY RIGHT- OF- WAY, A DRIVEWAY PERMIT SHALL BE REQUIRED. CULVERT SIZE, LOCATION, AND INVERT INFORMATION WILL BE PROVIDED BY THE RIGHT- OF- WAY SERVICES DIVISION. STATE OR COUNTY PERMITS SHALL BE REQUIRED IF WITHIN THOSE RIGHT- OF- WAY.
3. EXISTING SIDEWALKS AND BIKE PATHS SHALL NOT BE CHANGED IN ANY MANNER EITHER IN LOCATION OR ELEVATION, UNLESS OTHERWISE SPECIFIED.

**ASPHALT COMMERCIAL DRIVEWAY DETAIL**

(N.T.S.)



**CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT**

**STANDARD DRIVEWAY DETAIL**

**SDW - 03**

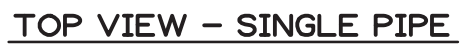
DATE: **APRIL 2019**

APPROVED: \_\_\_\_\_









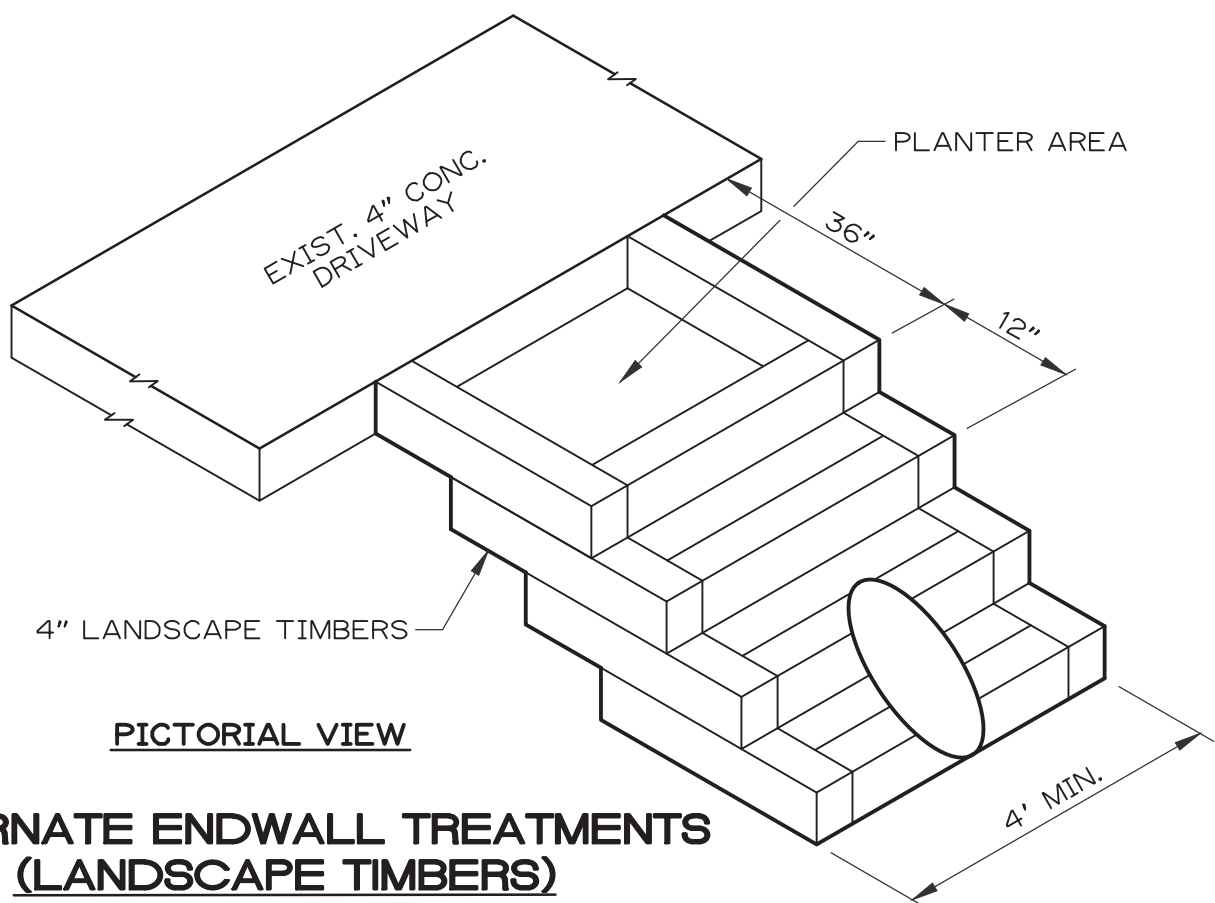
(N.T.S.)





## NOTES:

1. ALL CONSTRUCTION SHALL CONFORM TO THE CITY OF PALM BAY STANDARDS AND SPECIFICATIONS.
2. IN CITY RIGHT- OF- WAY, A DRIVEWAY PERMIT SHALL BE REQUIRED FOR NEW CONSTRUCTION. IF DRIVEWAY AND CULVERT EXISTS A RIGHT OF WAY USE PERMIT SHALL BE REQUIRED.
3. SLOPE OF 3:1 MUST BE MAINTAINED FROM DRIVEWAY SURFACE TO INVERT OF CULVERT. STANDARD DRIVEWAY PIPE EXTENSION IS 6 FEET. IF 3:1 SLOPE IS EXCEEDED THEN A LONGER PIPE EXTENSION WILL BE REQUIRED.
4. NO CHANGES CAN BE MADE TO THE STANDARD DESIGN WITHOUT THE PUBLIC WORKS DEPARTMENT APPROVAL. THE CITY UNDERSTANDS THAT SOME DEVIATION MUST BE MADE TO FIT DIFFERENT FIELD CONDITIONS, BUT THE STANDARD DESIGN SHOULD BE FOLLOWED AS NEAR AS POSSIBLE.
5. END TREATMENT FOR COLLECTOR ROADS, FEDERAL HIGHWAY ADMINISTRATION ROADS, ROADS WITH SPEED LIMITS OVER 30 MPH SHALL MEET FDOT DESIGN STANDARD INDEX 272 OR 273.
6. END TREATMENT SHALL NOT BE CONSTRUCTED IN CLEAR ZONE (MUST BE GREATER THAN 8 FEET FROM EDGE OF PAVEMENT).
7. ALL PLANTS / SHRUBS MUST BE 1 GALLON OR LESS AND SHALL BE NO HIGHER THAN 2 FEET TO REMAIN BELOW THE CLEAR SIGHT WINDOW.
8. PLANTS / SHRUBS SHALL BE SET FLUSH WITH THE SURROUNDING GRADE.
9. FOR GENERAL PLANTING GUIDELINES, REFER TO THE FLORIDA HIGHWAY LANDSCAPE GUIDE, RECOMMENDED HIGHWAY PLANT MATERIALS (TABLE 4 – GROUND COVERS AND TABLE 5 – SHRUBS).



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

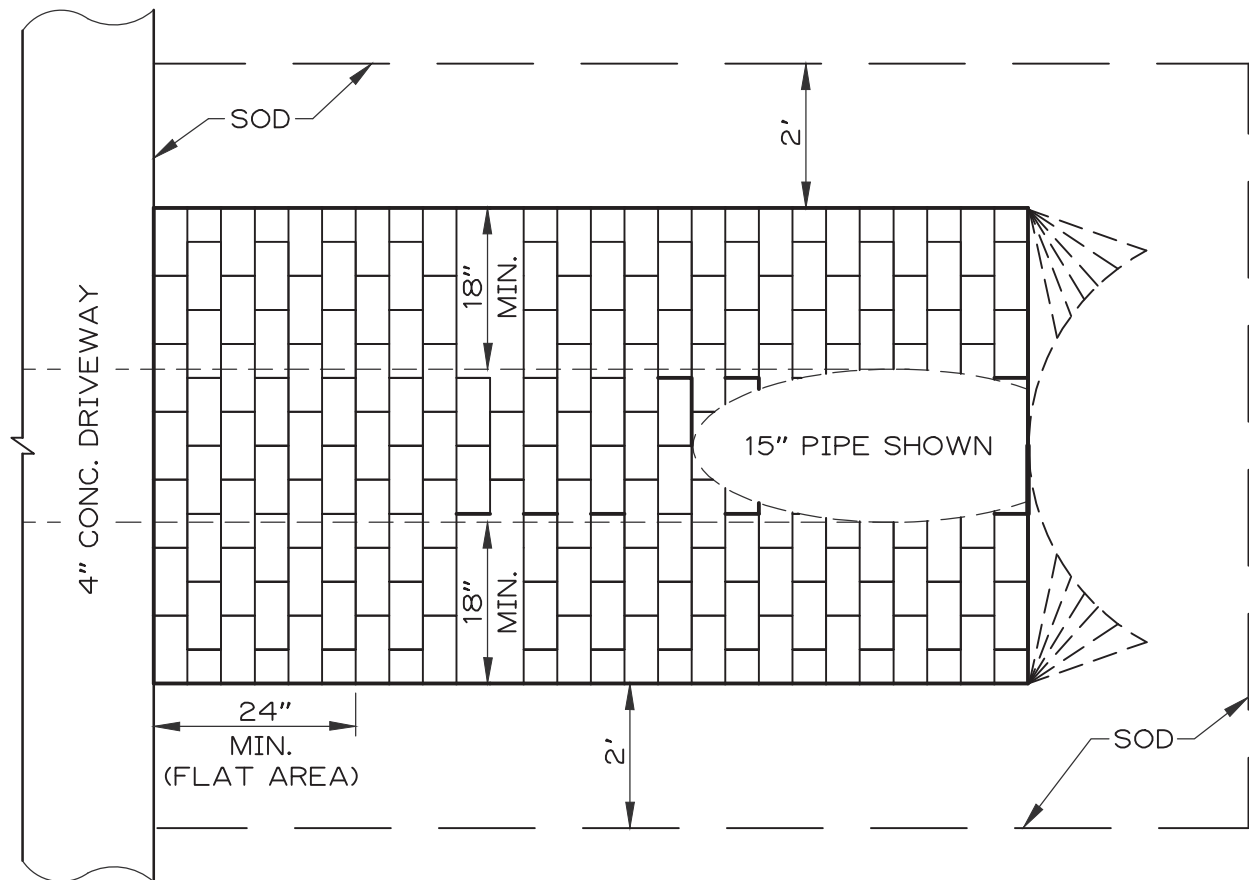
STANDARD DRAINAGE DETAIL

SDW – 05 (2 OF 2)

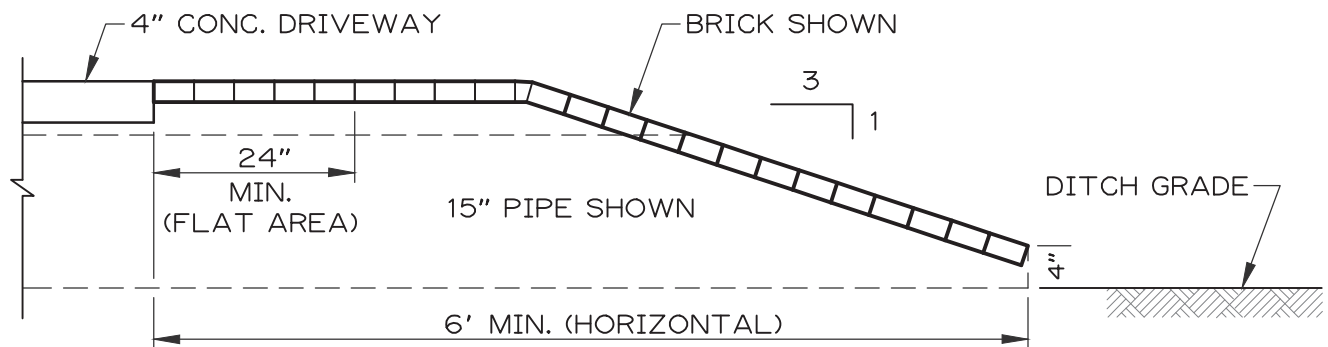
DATE: APRIL 2019

APPROVED: \_\_\_\_\_





**TOP VIEW - SINGLE PIPE**



**SECTION**

# **ALTERNATE ENDWALL TREATMENTS (BRICK, PAVERS, STONE OR STAMPED CONCRETE)**

(N.T.S.)



**CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT**

**STANDARD DRAINAGE DETAIL**

**SDW - 06 (1 OF 2)**

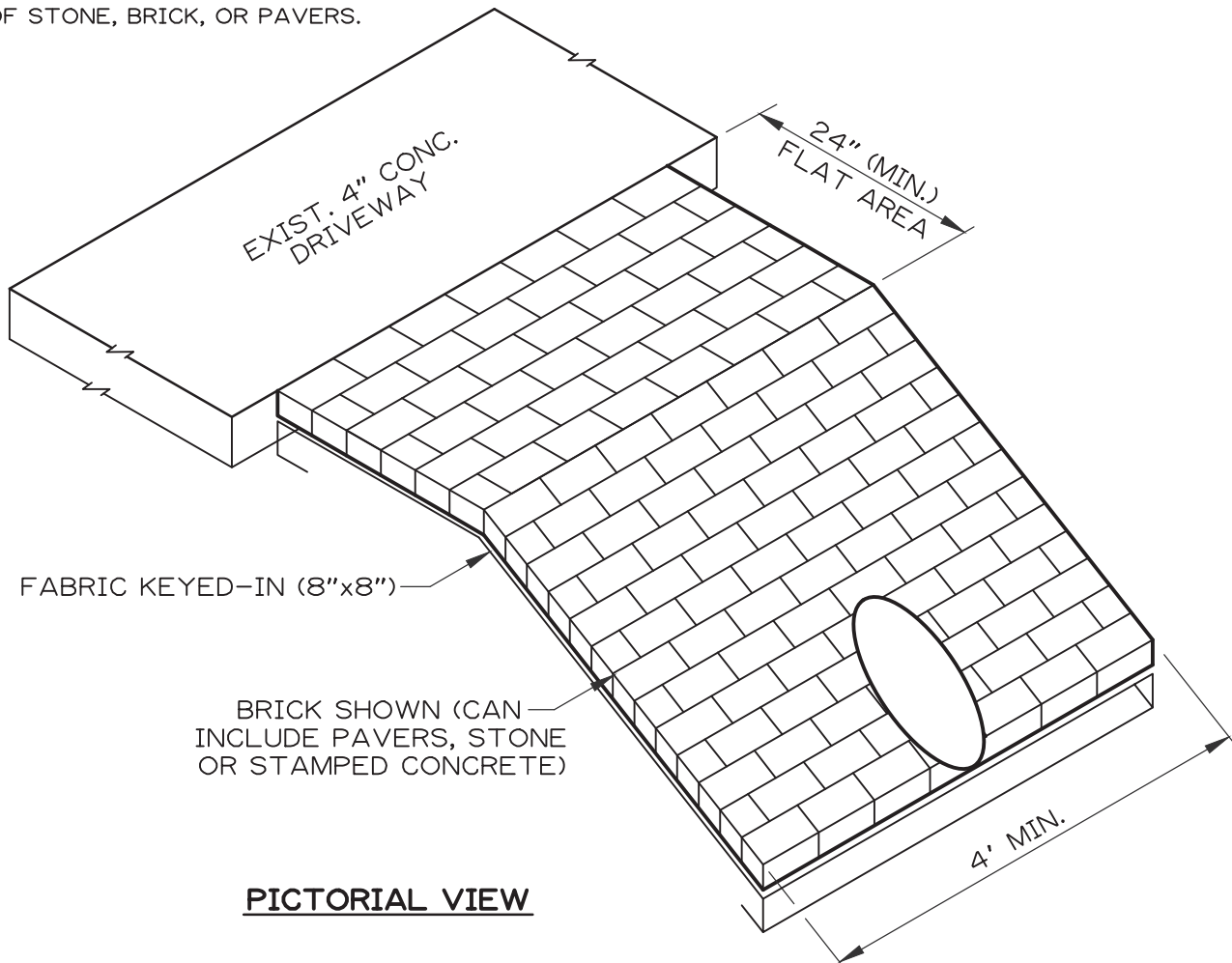
DATE: APRIL 2019

APPROVED: \_\_\_\_\_



## NOTES:

1. ALL CONSTRUCTION SHALL CONFORM TO THE CITY OF PALM BAY STANDARDS AND SPECIFICATIONS.
2. IN CITY RIGHT- OF- WAY, A DRIVEWAY PERMIT SHALL BE REQUIRED FOR NEW CONSTRUCTION. IF DRIVEWAY AND CULVERT EXISTS A RIGHT OF WAY USE PERMIT SHALL BE REQUIRED.
3. SLOPE OF 3:1 MUST BE MAINTAINED FROM DRIVEWAY SURFACE TO INVERT OF CULVERT. STANDARD DRIVEWAY PIPE EXTENSION IS 6 FEET. IF 3:1 SLOPE IS EXCEEDED THEN A LONGER PIPE EXTENSION WILL BE REQUIRED.
4. AREAS REQUIRING END TREATMENTS MUST HAVE VEGETATION.
5. NO CHANGES CAN BE MADE TO THE STANDARD DESIGN WITHOUT THE PUBLIC WORKS DEPARTMENT APPROVAL. THE CITY UNDERSTANDS THAT SOME DEVIATION MUST BE MADE TO FIT DIFFERENT FIELD CONDITIONS, BUT THE STANDARD DESIGN SHOULD BE FOLLOWED AS NEAR AS POSSIBLE.
6. END TREATMENT FOR COLLECTOR ROADS, FEDERAL HIGHWAY ADMINISTRATION ROADS, ROADS WITH SPEED LIMITS OVER 30 MPH SHALL MEET FDOT DESIGN STANDARD INDEX 272 OR 273.
7. END TREATMENT SHALL NOT BE CONSTRUCTED IN CLEAR ZONE (GREATER THAN 8 FT FROM EOP).
8. A NON-WOVEN GEOTEXTILE FABRIC SHALL BE PLACED ON COMPACTED SOIL PRIOR TO PLACEMENT OF STONE, BRICK, OR PAVERS.



**PICTORIAL VIEW**

## **ALTERNATE ENDWALL TREATMENTS (BRICK, PAVERS, STONE OR STAMPED CONCRETE)**

(N.T.S.)



**CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT**

**STANDARD DRAINAGE DETAIL**

**SDW - 06 (2 OF 2)**

DATE: APRIL 2019

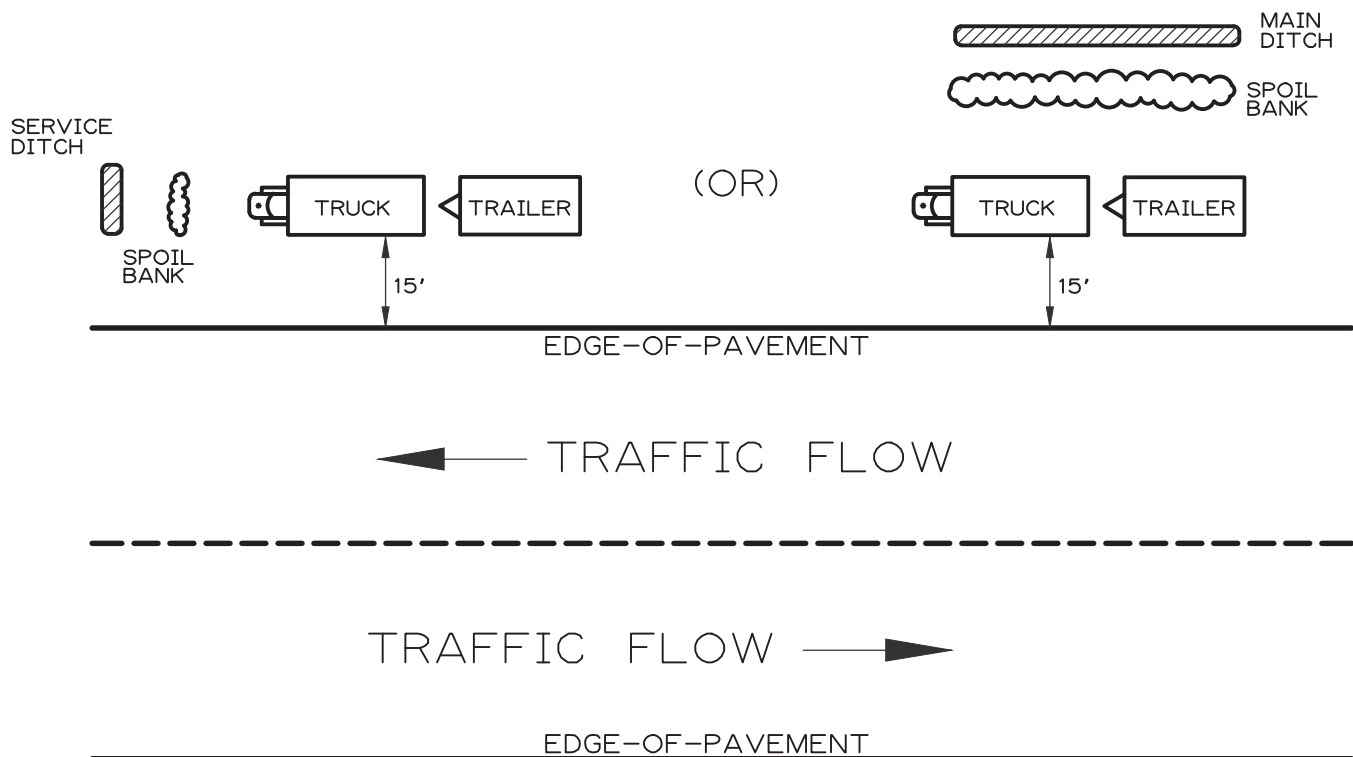
APPROVED: \_\_\_\_\_



SITUATION SUMMARY	
LANES OF TRAFFIC	2
SIDES OF WORK	1
LANES CLOSED	0
OFF PAV'T	+15'

### SAFETY NOTICE:

IF THE PROPOSED WORK ZONE SITE CONDITIONS MEET OR EXCEED THE EXAMPLE SHOWN, A MOT PLAN IS NOT REQUIRED. IF THE WORK ZONE IS CLOSER THEN 15' TO THE EDGE-OF-PAVEMENT, REFER TO GENERAL NOTE 3.



### GENERAL NOTES:

1. TWO LANES, TWO WAY TRAFFIC, ONE SIDE OPERATION, NO LANE CLOSURE. WORK AREA MORE THAN 15' OFF PAVEMENT.
2. WORK AREA PROTECTION IS NOT NECESSARY WHEN VEHICLES, EQUIPMENT, WORKERS AND THEIR ACTIVITIES ARE MORE THAN 15' FROM THE EDGE-OF-PAVEMENT. TRUCK FLASHER LIGHTS SHALL BE USED.
3. FOR ANY WORK CLOSER THAN 15' TO THE EDGE-OF-PAVEMENT OR ON THE PAVEMENT, REFER TO THE FLORIDA DEPARTMENT OF TRANSPORTATION "ROADWAY AND TRAFFIC DESIGN STANDARDS" INDEX 600 (MOST CURRENT EDITION). THE APPLICABLE INDEX 600 STANDARD SHALL BE USED IN ALL CASES.

## MAINTENANCE OF TRAFFIC

(N.T.S.)



**CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT**

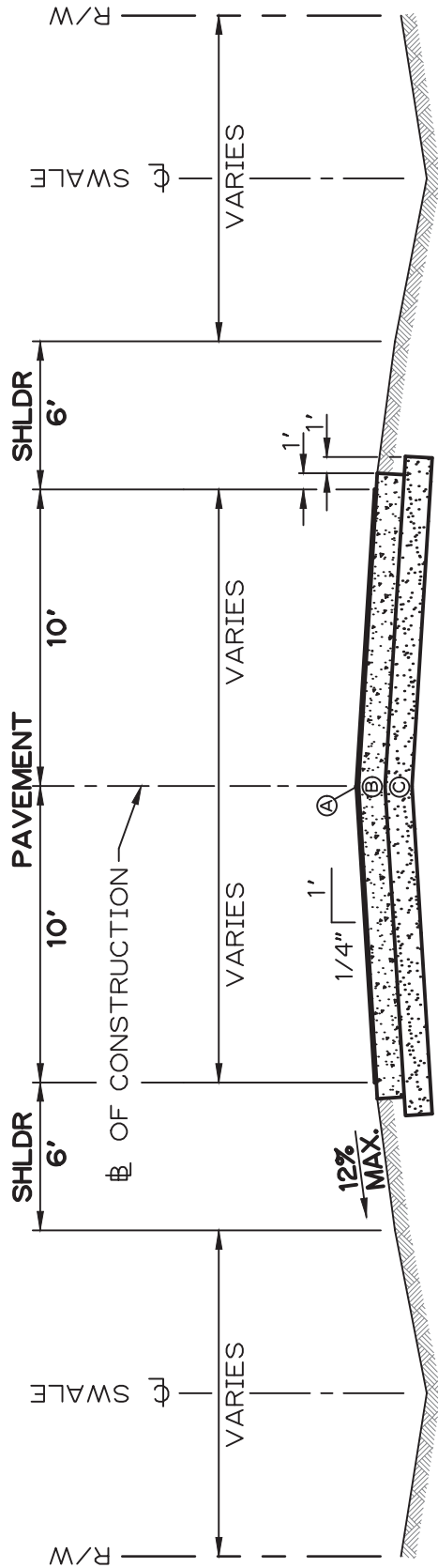
**STANDARD MAINTENANCE  
OF TRAFFIC**

**SMOT - 01**

DATE: APRIL 2019

APPROVED: \_\_\_\_\_





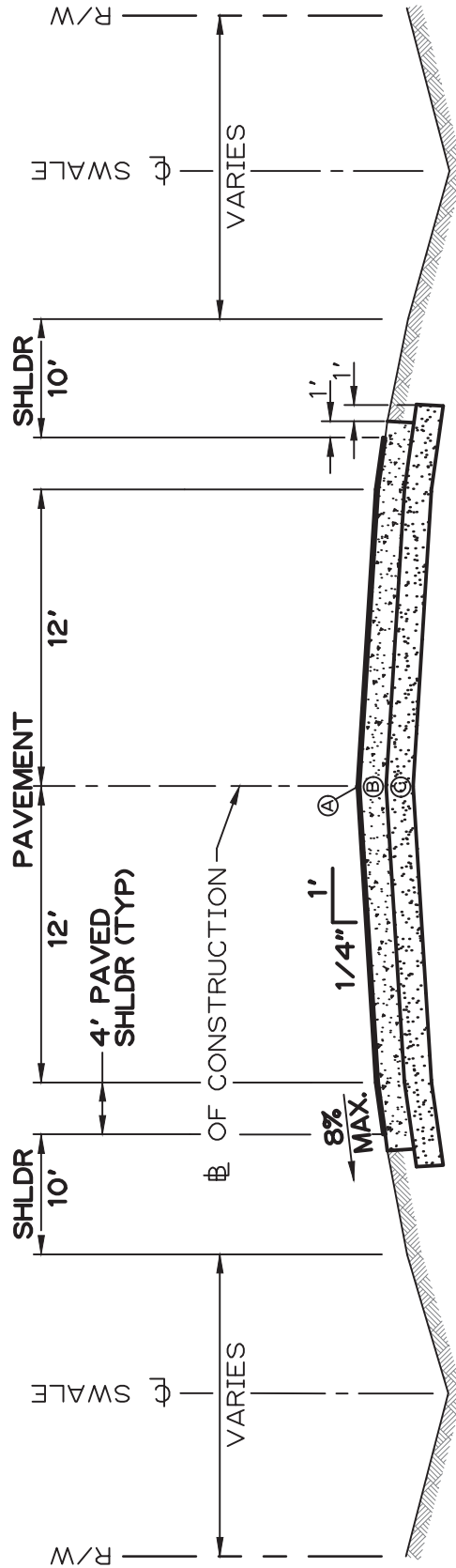
④ = 1 1/2" FDOT SP-9.5 ASPHALT CONCRETE PER FDOT SPECIFICATIONS SECTION 334 LAP  
 ⑥ = 8" LIMEROCK OR CEMENTED COQUINA BASE, LBR 100, 98% MAX. DENSITY PER AASHTO T-180  
 ③ = 8" TYPE "B" STABILIZED SUBBASE, LBR 40, 98% MAX. DENSITY, PER AASHTO T-180

## NOTES

1. BUILD UP SHOULDER WITH SUITABLE MATERIAL TO MEET NEW PAVEMENT SURFACE.
2. SEED AND MULCH ALL UNDEVELOPED DISTURBED AREAS.
3. SOD 2' STRIP ALONG NEW EDGE OF PAVEMENT.
4. CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS.

# LOCAL ROAD TYPICAL SECTION





- Ⓐ = 2" FDOT SP-9.5 ASPHALT CONCRETE PER FDOT SPECIFICATIONS SECTION 334 LAP
- Ⓑ = 10" LIMEROCK OR CEMENTED COQUINA BASE, LBR 100, 98% MAX. DENSITY PER AASHTO T-180
- Ⓒ = 10" TYPE "B" STABILIZED SUBBASE, LBR 40, 98% MAX. DENSITY, PER AASHTO T-180

#### NOTES:

1. BUILD UP SHOULDER WITH SUITABLE MATERIAL TO MEET NEW PAVEMENT SURFACE.
2. SEED AND MULCH ALL UNDEVELOPED DISTURBED AREAS.
3. SOD 2' STRIP ALONG NEW EDGE OF PAVEMENT.
4. CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS.

## COLLECTOR ROAD TYPICAL SECTION



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

STANDARD ROAD DETAIL

SR - 02

DATE: JAN 2024

APPROVED: FTW





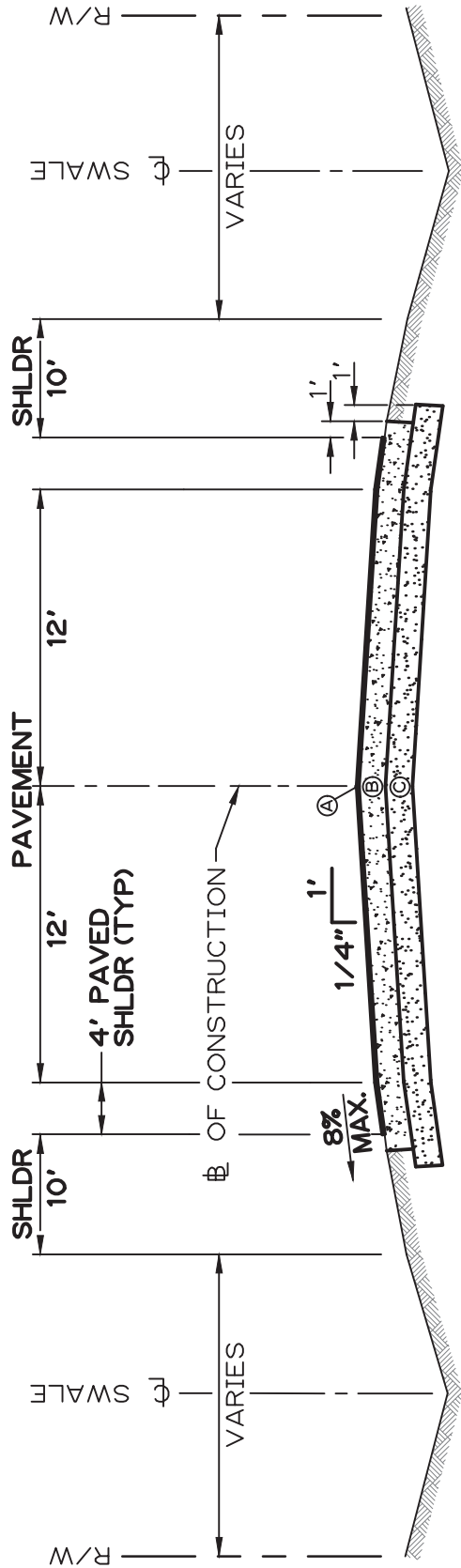
CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

STANDARD ROAD DETAIL

SR - 03

DATE: JAN 2024

APPROVED: FTW



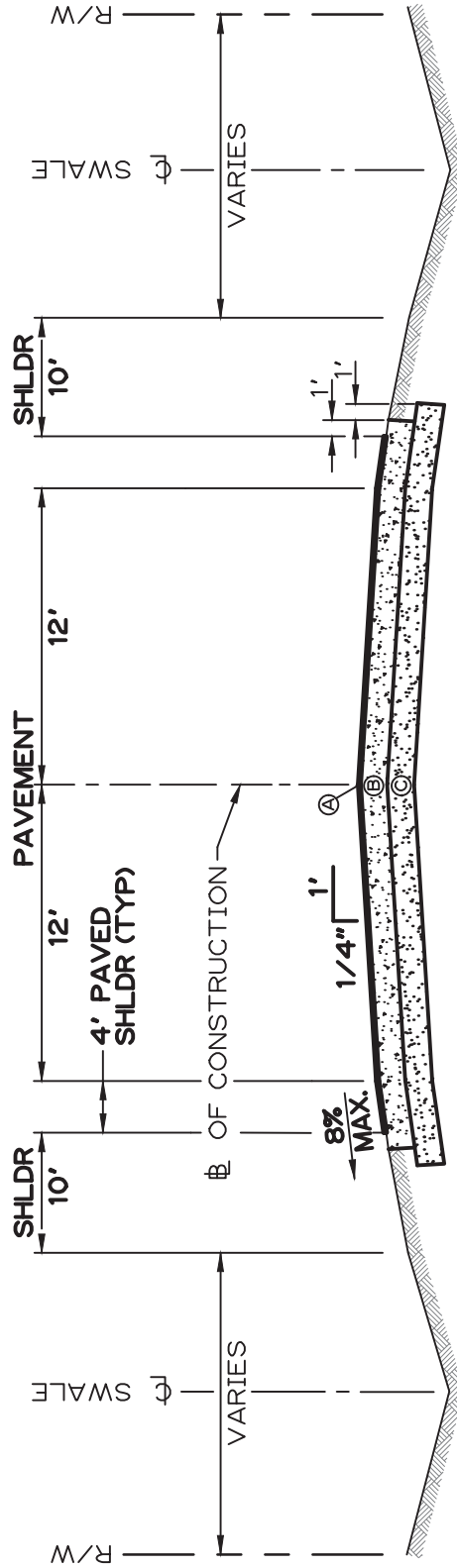
- Ⓐ = 3" FDOT SP-12.5 ASPHALT CONCRETE PER FDOT SPECIFICATIONS SECTION 334 LAP
- Ⓑ = 12" LIMEROCK OR CEMENTED COQUINA BASE, LBR 100, 98% MAX. DENSITY PER AASHTO T-180
- Ⓒ = 12" TYPE "B" STABILIZED SUBBASE, LBR 40, 98% MAX. DENSITY, PER AASHTO T-180

NOTES:

1. BUILD UP SHOULDER WITH SUITABLE MATERIAL TO MEET NEW PAVEMENT SURFACE.
2. SEED AND MULCH ALL UNDEVELOPED DISTURBED AREAS.
3. SOD 2' STRIP ALONG NEW EDGE OF PAVEMENT.
4. CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS.

ARTERIAL ROAD  
TYPICAL SECTION





- Ⓐ = 3" FDOT SP-12.5 ASPHALTIC CONCRETE
- Ⓑ = 12" LIMEROCK OR CEMENTED COQUINA BASE, LBR 100, 98% MAX. DENSITY PER AASHTO T-180
- Ⓒ = 12" TYPE "B" STABILIZED SUBBASE, LBR 40, 98% MAX. DENSITY, PER AASHTO T-180

#### NOTES:

1. BUILD UP SHOULDER WITH SUITABLE MATERIAL TO MEET NEW PAVEMENT SURFACE.
2. SEED AND MULCH ALL UNDEVELOPED DISTURBED AREAS.
3. SOD 2' STRIP ALONG NEW EDGE OF PAVEMENT.
4. CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS.

## ARTERIAL ROAD TYPICAL SECTION



**CITY OF PALM BAY**  
**PUBLIC WORKS DEPARTMENT**

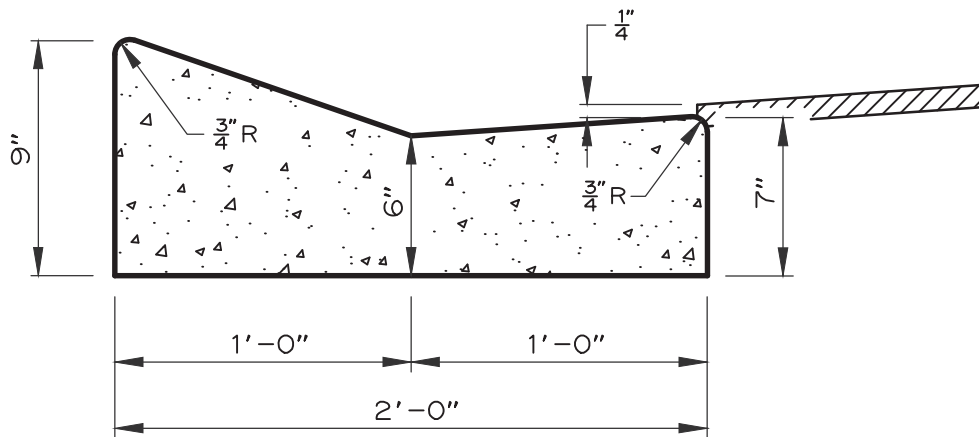
**STANDARD ROAD DETAIL**

**SR - 03**

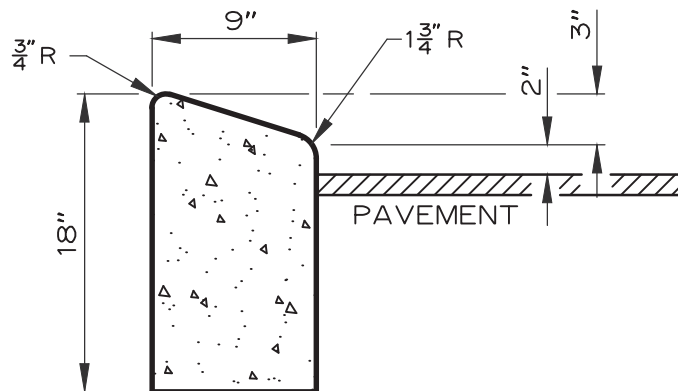
DATE: APRIL 2019

APPROVED: \_\_\_\_\_



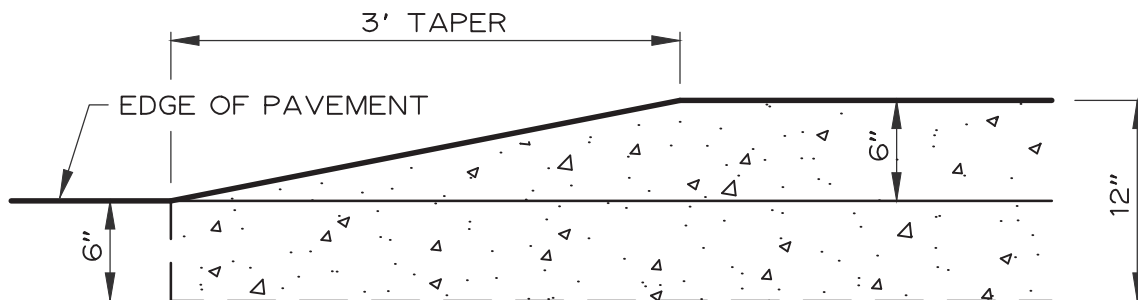


## CONCRETE CURB AND GUTTER DETAIL

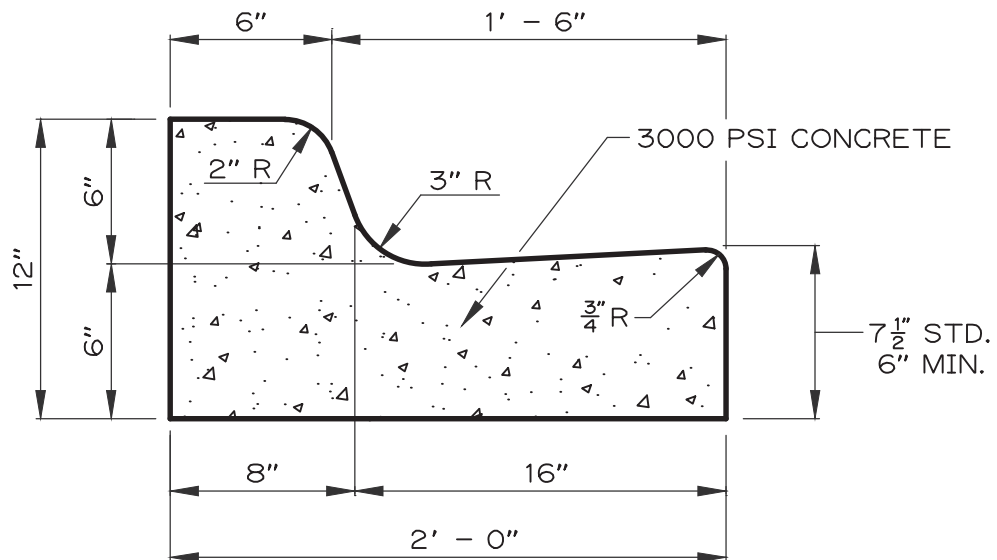


## MODIFIED HEADER CURB DETAIL





## CONCRETE CURB TERMINUS



## TYPE 'F' CURB DETAIL



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

STANDARD ROAD DETAIL

SR - 05

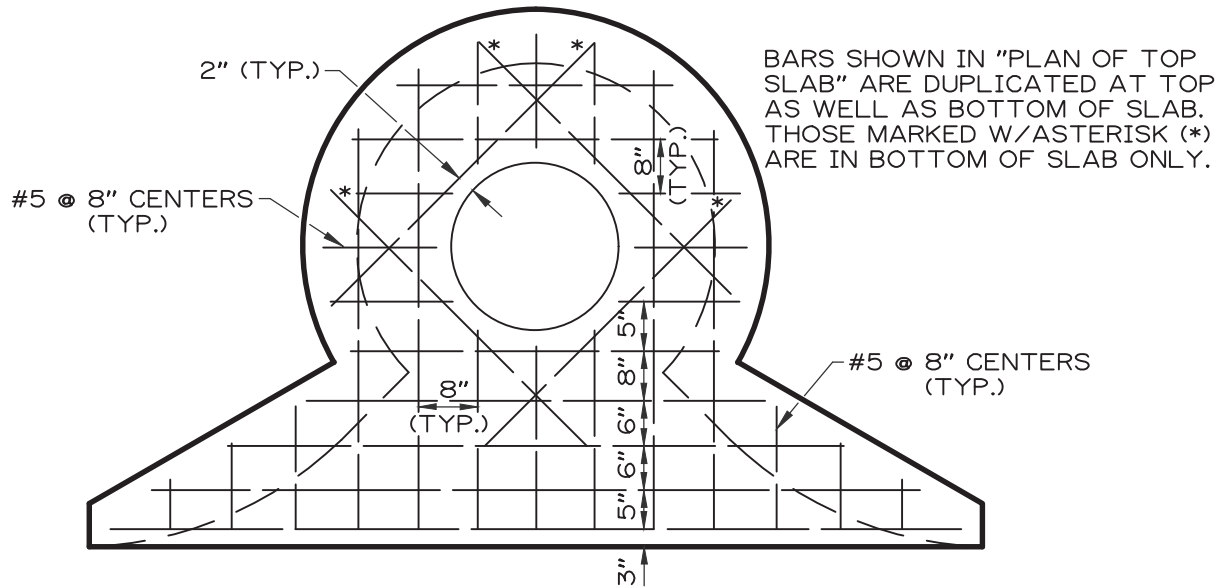
DATE: APRIL 2019

APPROVED: \_\_\_\_\_

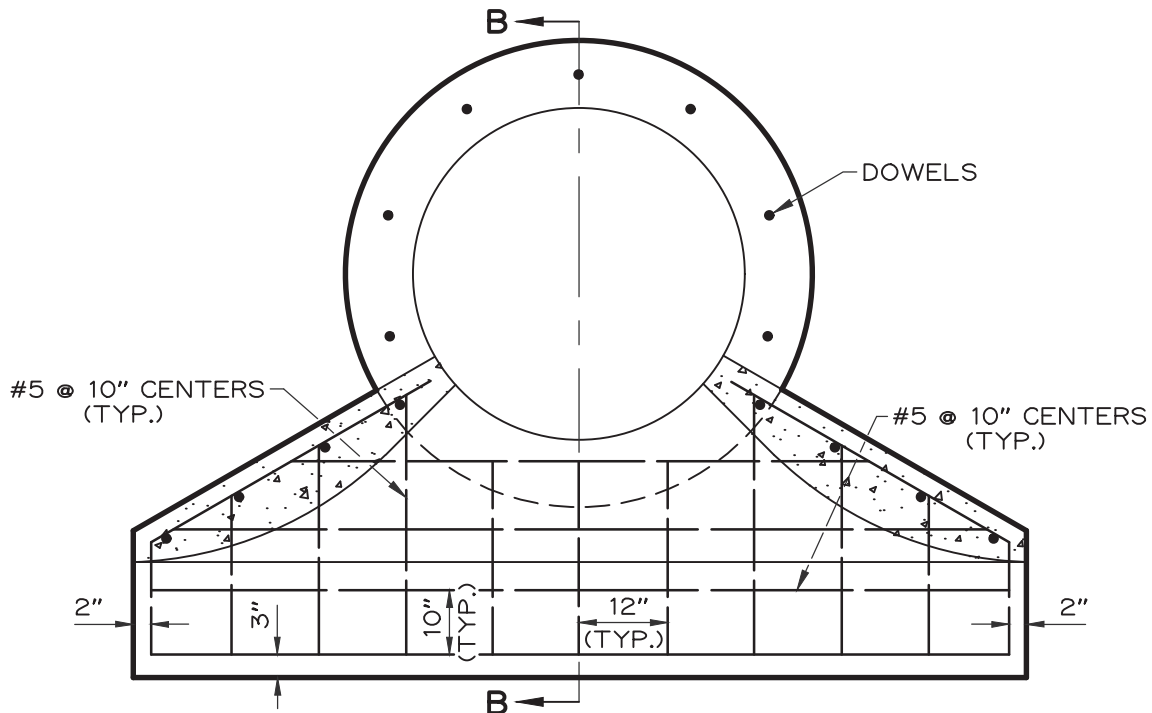




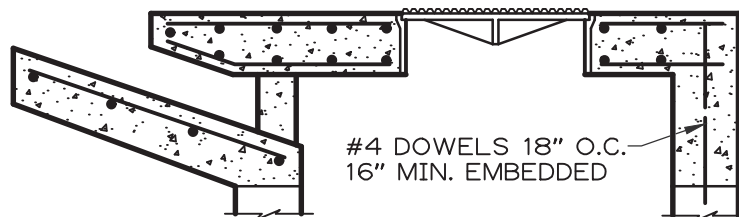




**PLAN OF TOP SLAB**



**PLAN BELOW TOP SLAB**



**SECTION B-B**

**CURB INLET REINFORCING DETAIL**



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

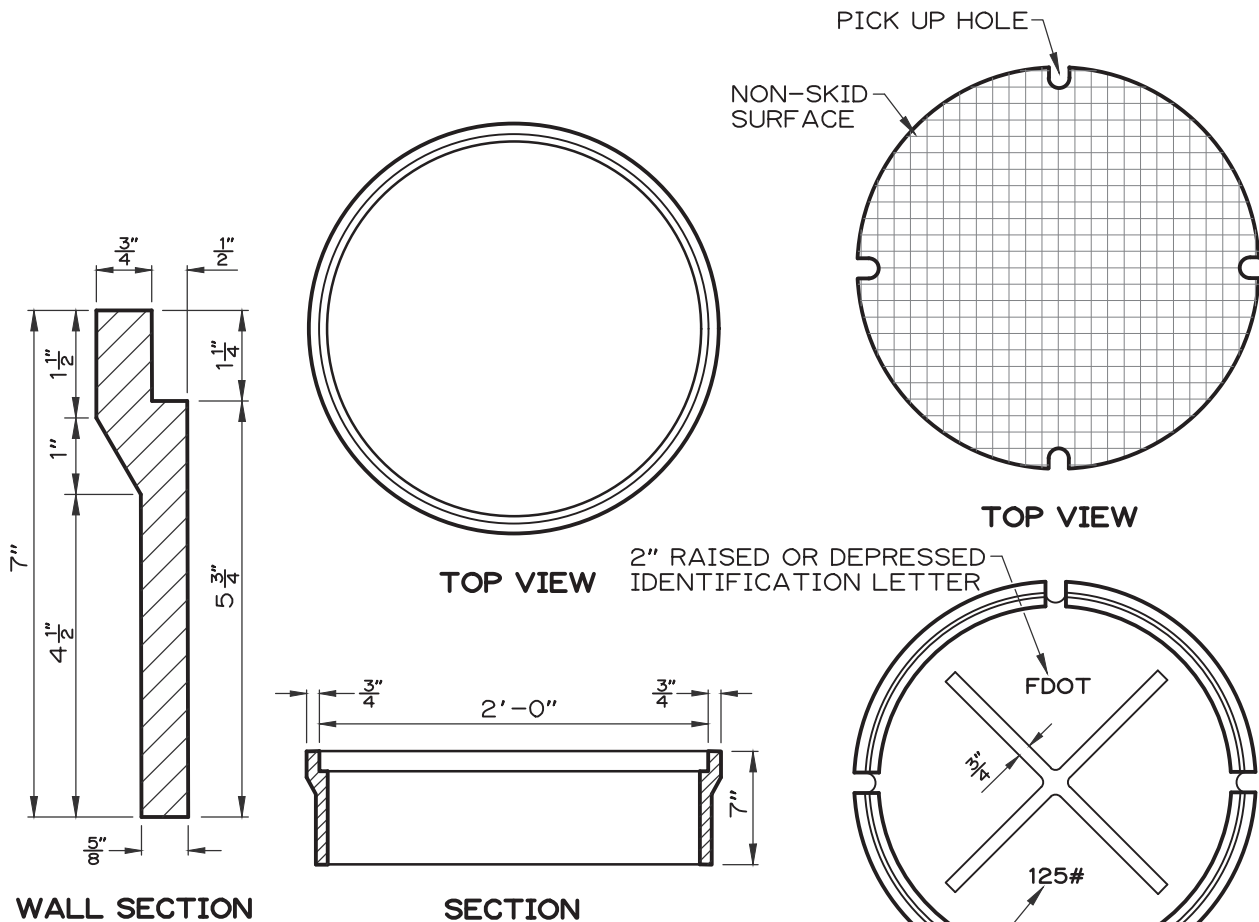
STANDARD ROAD DETAIL

SR - 06 (2 OF 4)

DATE: APRIL 2019

APPROVED: \_\_\_\_\_

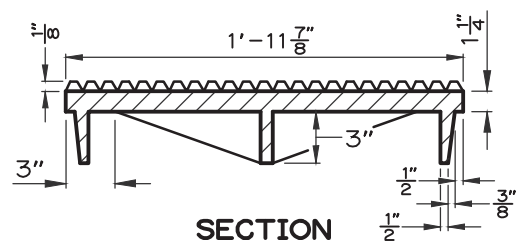




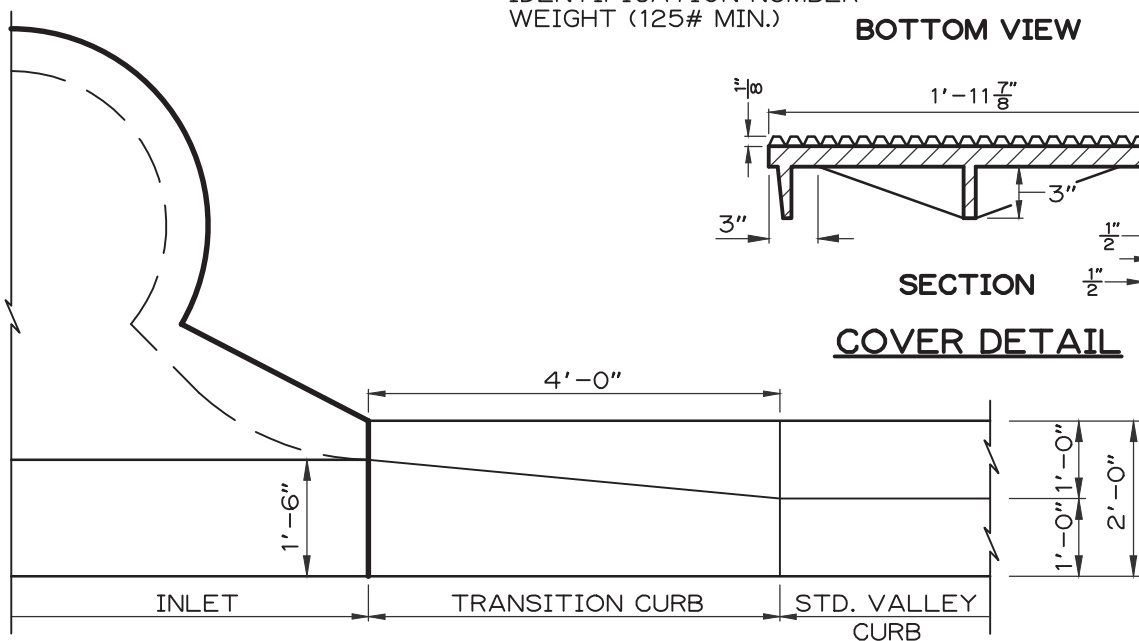
### FRAME DETAIL

2" RAISED OR DEPRESSED IDENTIFICATION NUMBER WEIGHT (125# MIN.)

### **BOTTOM VIEW**



### COVER DETAIL



### TRANSITION CURB INLET DETAIL



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

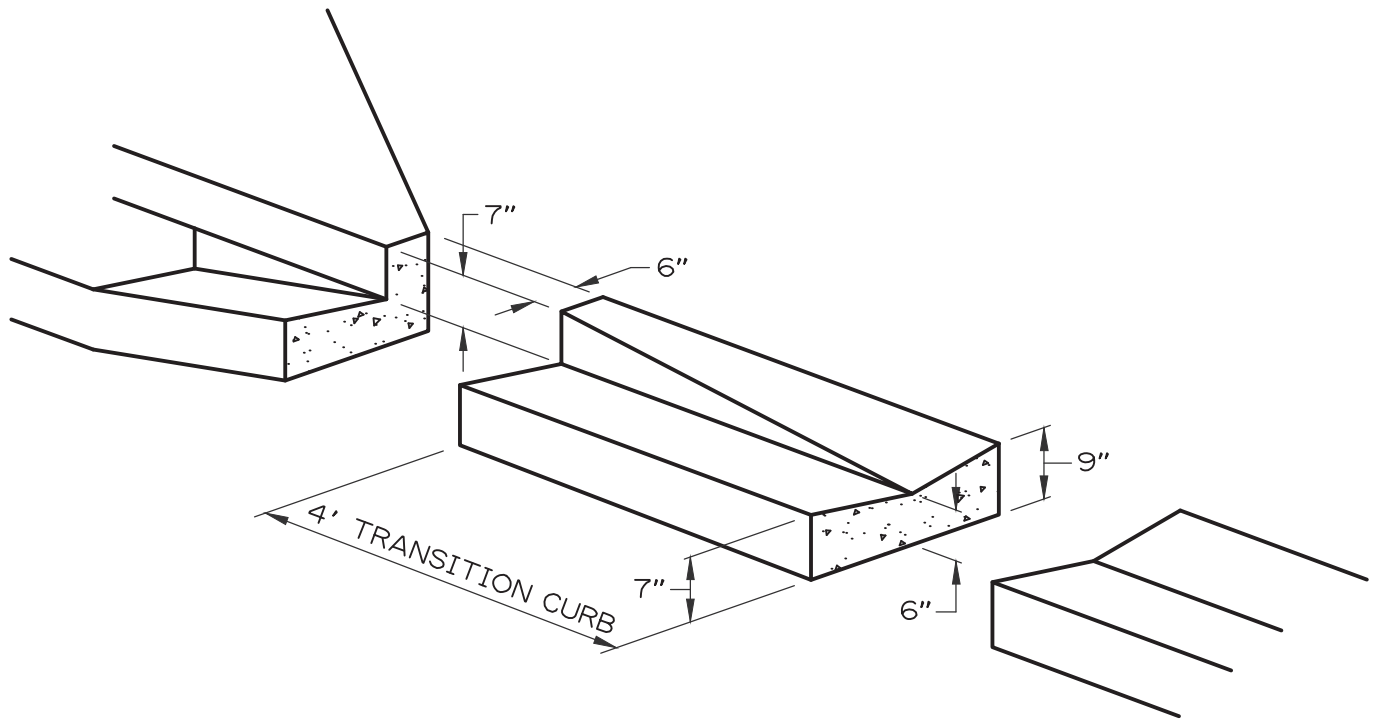
STANDARD ROAD DETAIL

SR - 06 (3 of 4)

DATE: APRIL 2019

APPROVED: \_\_\_\_\_





**GENERAL NOTES:**

1. ALL STEEL BARS SHALL BE TIED TOGETHER.
2. CHAMFER ALL EXPOSED EDGES AND CORNERS  $\frac{3}{4}$ ".
3. REINFORCING STEEL SHALL BE GRADE 40 OR 60.
4. ALL CONCRETE SHALL BE CLASS II.
5. ALL STEEL BARS SHALL HAVE  $1\frac{1}{2}$ " MINIMUM COVER.

**TRANSITION CURB DETAIL**



**CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT**

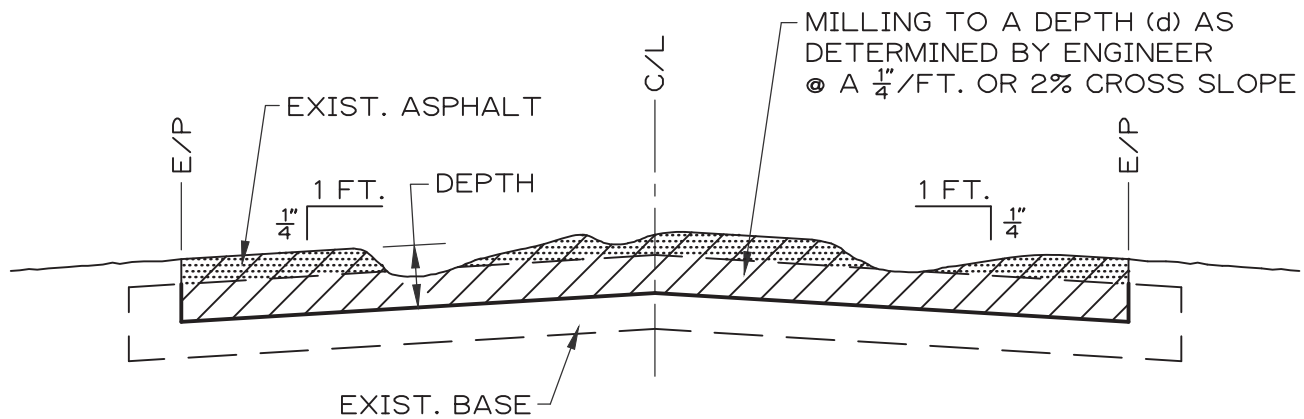
**STANDARD ROAD DETAIL**

**SR - 06 (4 of 4)**

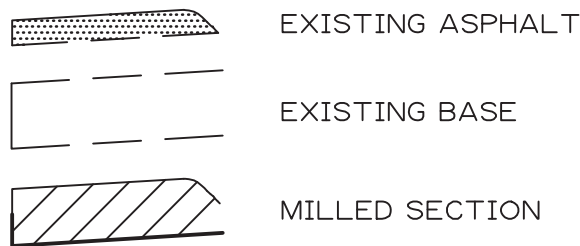
DATE: APRIL 2019

APPROVED: \_\_\_\_\_





### LEGEND:



DEPTH      MILLED DEPTH

### NOTES:

1. ACTUAL DEPTH WILL VARY PER PROJECT.
2. MILLING SHALL CONFORM TO LATEST FDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, SECTION 327.
3. PROFILES SHALL BE DONE IN STRAIGHT UNIFORM LINES, SIMILAR TO EXISTING. PROFILE ADJUSTMENTS MAY BE REQUIRED BY THE ENGINEER IN THE FIELD TO MEET EXISTING DRIVEWAYS, ROAD INTERSECTIONS OR AS REQUIRED BY ANY UNFORSEEN CONDITIONS.

## MILLING DETAIL



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

STANDARD ROAD DETAIL

SR - 07

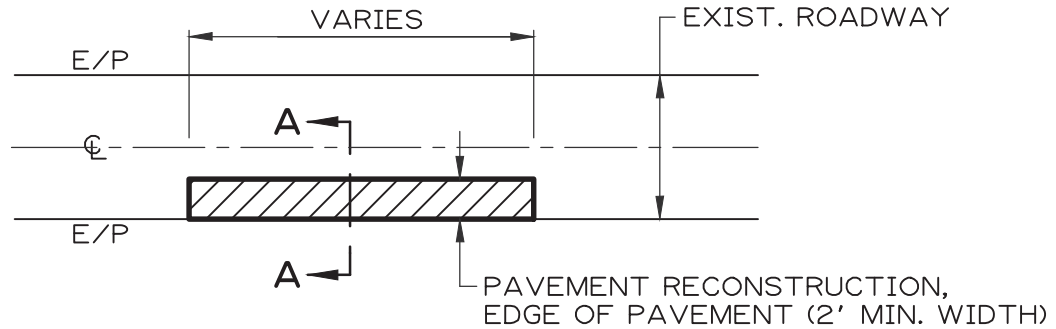
DATE: JAN 2024

APPROVED: FTW

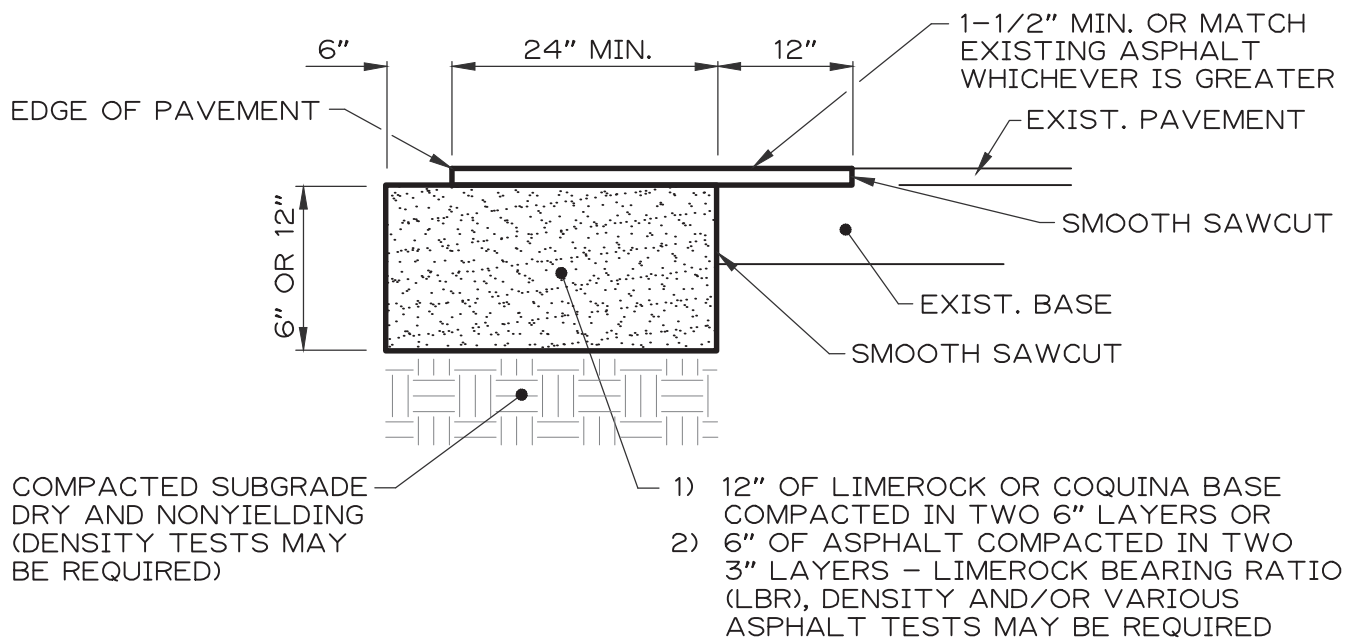








**PLAN VIEW**



NOTE:

ASPHALT TYPE FDOT S-I OR S-III, VERIFICATION REQUIRED

**SECTION "A-A"**

**GENERAL NOTES:**

1. LONGITUDINAL CUTS SHALL BE NEAT SAWCUT LINES PARALLEL TO EDGE OF PAVEMENT.
2. TRANSVERSE CUTS SHALL BE NEAT SAWCUT LINES AT RIGHT ANGLES TO PAVEMENT CENTERLINE.
3. BASE SHALL BE RECONSTRUCTED 6" OUTSIDE OF EDGE OF PAVEMENT.

**EDGE OF PAVEMENT RECONSTRUCTION DETAIL**



**CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT**

**STANDARD ROAD DETAIL**

**SR - 09**

DATE: APRIL 2019

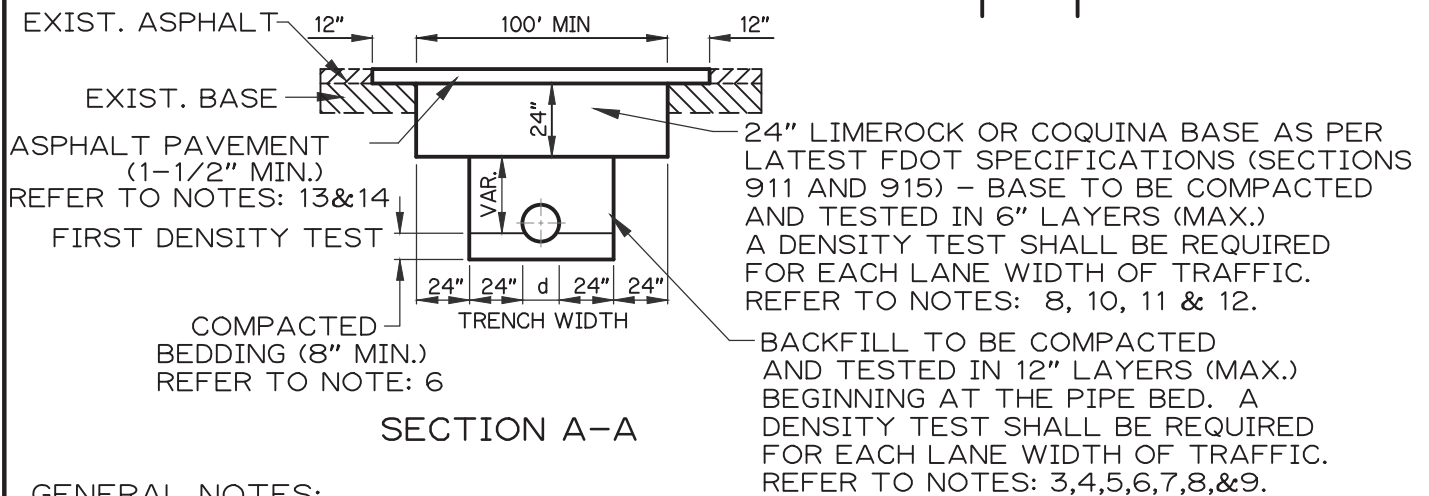
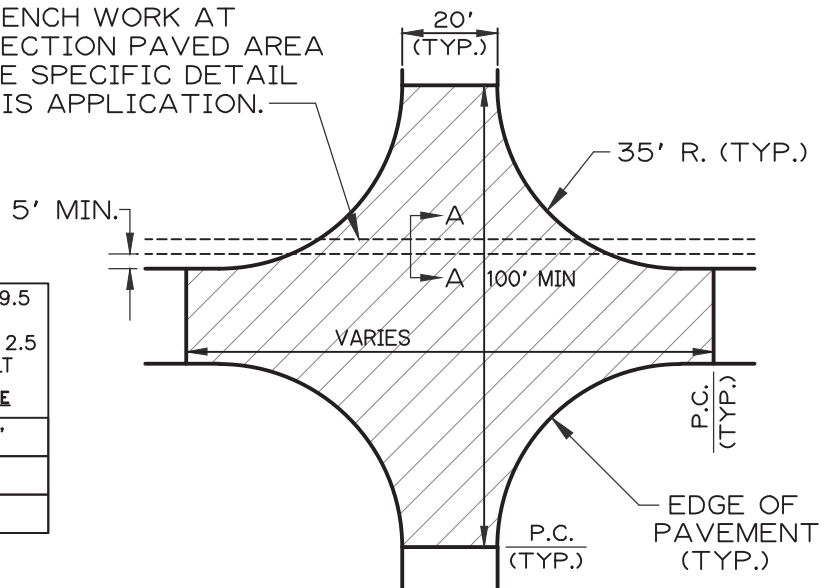
APPROVED: \_\_\_\_\_



- FOR TRENCH WORK AT INTERSECTION PAVED AREA SEE THE SPECIFIC DETAIL FOR THIS APPLICATION.

- TRENCH WORK FOR PAVEMENT REPAIR SHALL BE MINIMUM 50FT ON EITHER SIDE OF TRENCH

PAVEMENT CROSS SECTION TABLE			TYPE SP9.5 OR TYPE SP12.5 ASPHALT
	SUB-BASE	BASE	SURFACE
LOCAL	8"	8"	1-1/2"
COLLECTOR	10"	10"	2"
ARTERIAL	10"	12"	3"



#### GENERAL NOTES:

1. TRANSVERSE CUTS:  
THE ACTUAL RESURFACING REPAIR WIDTH MINIMUM SHALL BE 10' + PIPE DIAMETER (d) OR AS WIDE AS NECESSARY TO PROVIDE NEAT SAWCUT LINES AT RIGHT ANGLES TO PAVEMENT CENTERLINE.
2. LONGITUDINAL CUTS:  
THE PAVEMENT SHALL BE RESURFACED ALONG NEAT SAWCUT LINES FOR THE FULL LANE WIDTH FOR EACH LANE WITHIN WHICH THE CUT EXTENDS. REFER TO THE SPECIFIC DETAIL FOR THIS APPLICATION.
3. USE OF A SLOPE TRENCH WALL, TRENCH BOX, SHEETING OR SHORING SHALL MEET FLORIDA DEPARTMENT OF TRANSPORTATION AND OCCUPATIONAL SAFETY HEALTH ACT GUIDELINES.
4. CONSTRUCTION SHALL BE ACCOMPLISHED ONLY IN A DRY TRENCH.

(CONT. ON PAGE 2)

## TRENCH / PAVEMENT RESTORATION DETAIL



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

STANDARD ROAD DETAIL

SR - 10 (1 of 2)

DATE: JAN 2024

APPROVED: FTW



(CONT. FROM PAGE 1)

GENERAL NOTES:

5. THE MINIMUM TRENCH WIDTH SHALL BE 48"+ (DIAMETER OF PIPE) AT THE PIPE BED LEVEL.
6. UTILITY OR PIPE INSTALLATION SHALL BE PLACED ON 8" MINIMUM COMPACTED SOIL BACKFILL IF THE EXPOSED MATERIAL IS UNSUITABLE OR DISTURBED. THE PIPE BED BACKFILL SOIL SHALL BE COMPACTED TO 98% MAXIMUM DENSITY, AS PER AASHTO T180-D METHOD. 3/4" ROCK GRAVEL, NUMBER 57 STONE, CLEAN NATURAL SAND, IMPORTED QUARRY WASTE OR A MIXTURE THEREOF MAY BE USED AS AN ALTERNATIVE TO COMPACTED SOIL. SAMPLES OF THE MATERIAL SHALL BE SUBMITTED SUFFICIENTLY IN ADVANCE OF THE INTENDED USE TO ENABLE INSPECTION, TESTING AND APPROVAL OR REJECTION THEREOF.
7. BACKFILL SOIL SHALL BE COMPACTED IN MAXIMUM 12" LAYERS 98% MAXIMUM DENSITY, AS PER AASHTO T-180D METHOD. IN PLACE DENSITY TEST SHALL BE IN ACCORDANCE WITH AASHTO-T 310-06 METHOD. COMPACTION SHALL BE ACCOMPLISHED BY SUITABLE EQUIPMENT SPECIFICALLY DESIGNED FOR THIS PURPOSE.
8. LIMEROCK BASE SHALL HAVE AN LIMEROCK BEARING RATIO-LBR VALUE OF NOT LESS THAN ONE HUNDRED (100%) .
9. FLOWABLE BACKFILL MAY BE USED AS AN ALTERNATIVE TO COMPACTED SOIL. REFER TO THE FLORIDA DEPARTMENT OF TRANSPORTATION STANDARDS FOR THIS APPLICATION.
10. THE BASE SHALL BE RECONSTRUCTED A MINIMUM OF 12" BEYOND THE EDGE OF PAVEMENT.
11. LIMEROCK OR COQUINA BACKFILL SHALL BE COMPACTED IN 6" LAYERS (MAX.) TO 98% MAXIMUM DENSITY, AS PER FM-1-T180 METHOD "D".
12. DENSITY TEST SHALL BE ACCEPTED ON STABILIZED NON-YIELDING SURFACES ONLY.
13. PRIME COAT ALL SURFACES AND EDGES, PER FDOT SPECIFICATIONS SECTION 300. CLEAN ALL SURFACES PRIOR TO PAVING.
14. ASPHALT PAVEMENT SHALL BE FDOT TYPE SP9.5 OR SP12.5 (1-1/2" MIN.) OR CONSISTENT WITH EXISTING PAVEMENT THICKNESS (WHICHEVER IS GREATER) AND SHALL BE INSTALLED ON A CONTINUOUS PLANE WITHOUT HUMPS OR DEPRESSIONS.
15. THE MAX TRENCH PAVEMENT REPAIR SHALL BE 50FT ON EITHER SIDE OF TRENCH WORK.
16. REFER TO THE PALM BAY CODE OF ORDINANCE AND LATEST PUBLIC WORKS MANUAL (2024), OTHER CONDITIONS MAY APPLY.
17. ASPHALT CONCRETE TYPE SP9.5 OR SP12.5 SHALL BE PER FDOT STANDARD SPECIFICATIONS SECTION 334 LAP.



**CITY OF PALM BAY**  
**PUBLIC WORKS DEPARTMENT**

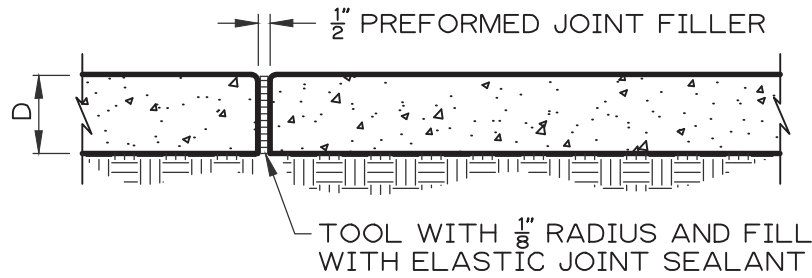
**STANDARD ROAD DETAIL**

**SR - 10 (2 of 2)**

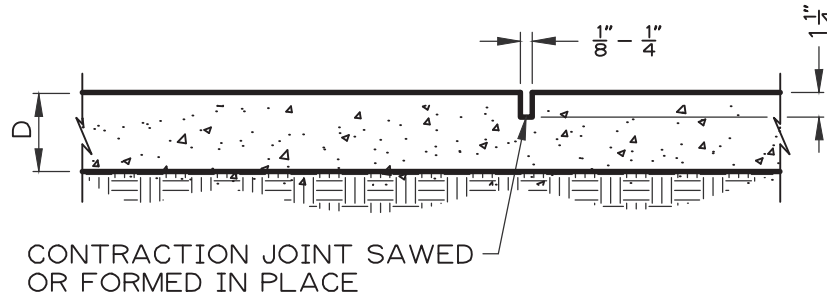
DATE: JAN 2024

APPROVED: FTW

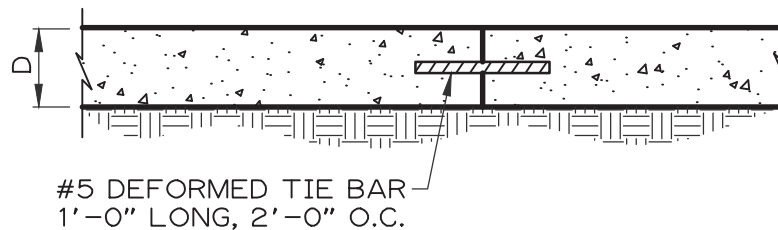




### SECTION A-A



### SECTION B-B



### SECTION C-C

D = 6" FOR COLLECTOR ROADS  
D = 5" FOR LOCAL ROADS

#### NOTES:

1. APPLY #5 DEFORMED TIE BARS 1'-0" LONG, SPACED 2'-0" O.C. ALONG THE LONGITUDINAL JOINTS FROM ALL CURVE P.C.'S TO P.T.'S FOR CURVES WITH A RADIUS OF 150 FEET OR LESS. NOT APPLICABLE AT INTERSECTION LONGITUDINAL JOINTING.
2. JOINT SHALL BE TYPICALLY LOCATED AT THE P.C.'S AND P.T.'S OF ALL TYPES OF STREET INTERSECTIONS: "T" TYPE, SKEWED AND 4-WAY.
3. LONGITUDINAL JOINTS FOR INVERTED CROWN AND SLOPED PAVEMENTS SHALL BE SEALED WITH ELASTIC JOINT SEALANT.
4. IN AREAS WHERE RIGID PAVEMENT ABUTS EXISTING SANITARY SEWER MANHOLES AND NEW STORMWATER DRAINAGE STRUCTURES, EXPANSION JOINT MATERIALS SHOULD BE USED TO ISOLATE THESE STRUCTURES. IF FEASIBLE, MATCH EXISTING TRANSVERSE AND LONGITUDINAL PLANNED JOINTS OR BOX OUT STRUCTURE TO COINCIDE WITH PLANNED JOINTS.

## CONCRETE ROAD RECONSTRUCTION DETAIL



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

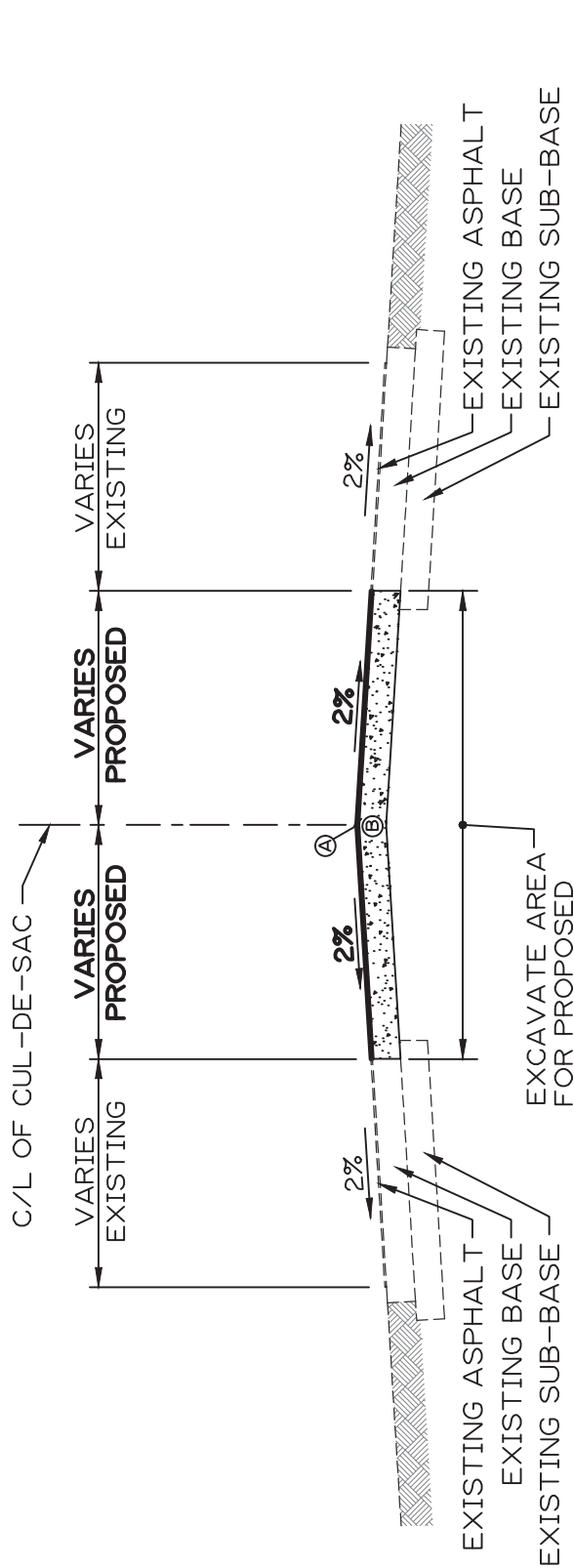
STANDARD ROAD DETAIL

SR - 11

DATE: APRIL 2019

APPROVED: \_\_\_\_\_





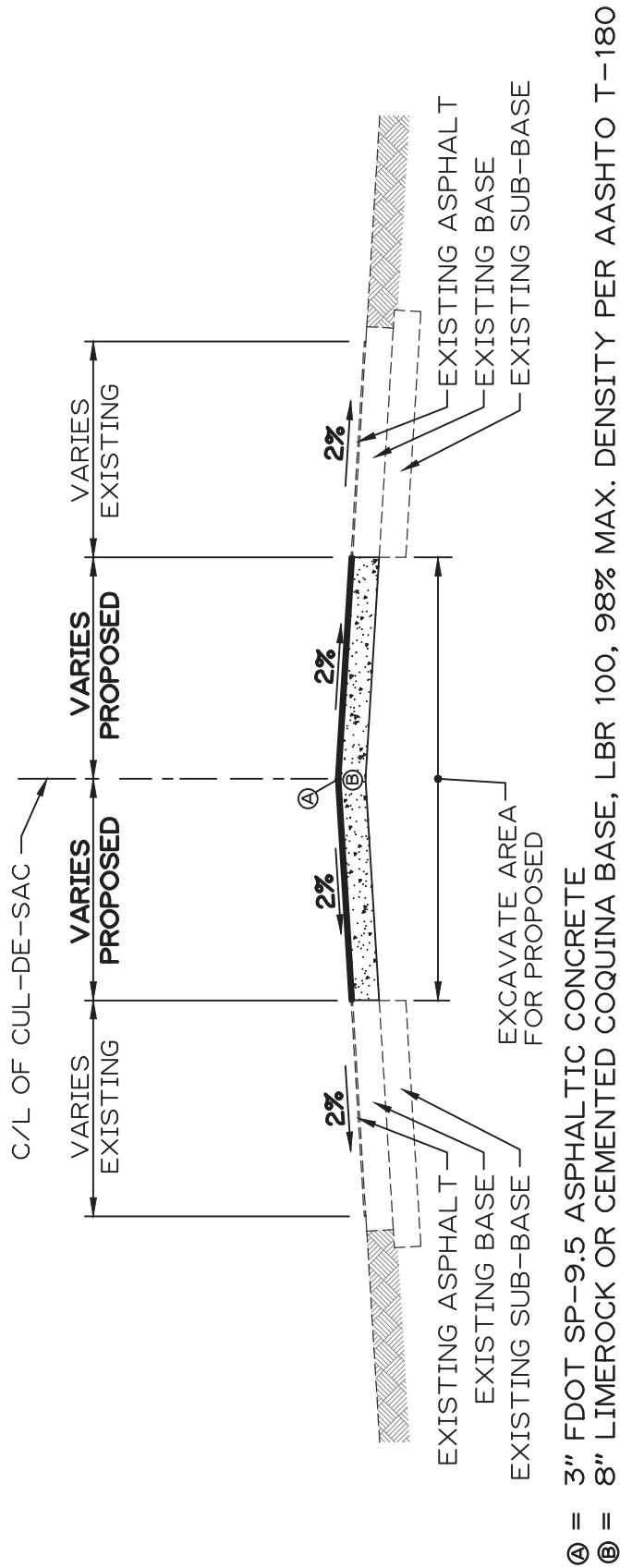
Ⓐ = 3" FDOT SP-9.5 ASPHALT CONCRETE PER FDOT SPECIFICATIONS SECTION 334 LAP  
Ⓑ = 8" LIMEROCK OR CEMENTED COQUINA BASE, LBR 100, 98% MAX. DENSITY PER AASHTO T-180

NOTES:

1. BUILD UP SHOULDER WITH SUITABLE MATERIAL TO MEET NEW PAVEMENT SURFACE.
2. SEED AND MULCH ALL UNDEVELOPED DISTURBED AREAS.
3. SOD 2' STRIP ALONG NEW EDGE OF PAVEMENT.
4. CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS.
5. EDGE GRADE 2' STRIP ALONG EXISTING PAVEMENT.

**CUL-DE-SAC**  
**TYPICAL SECTION**  
(N.T.S.)



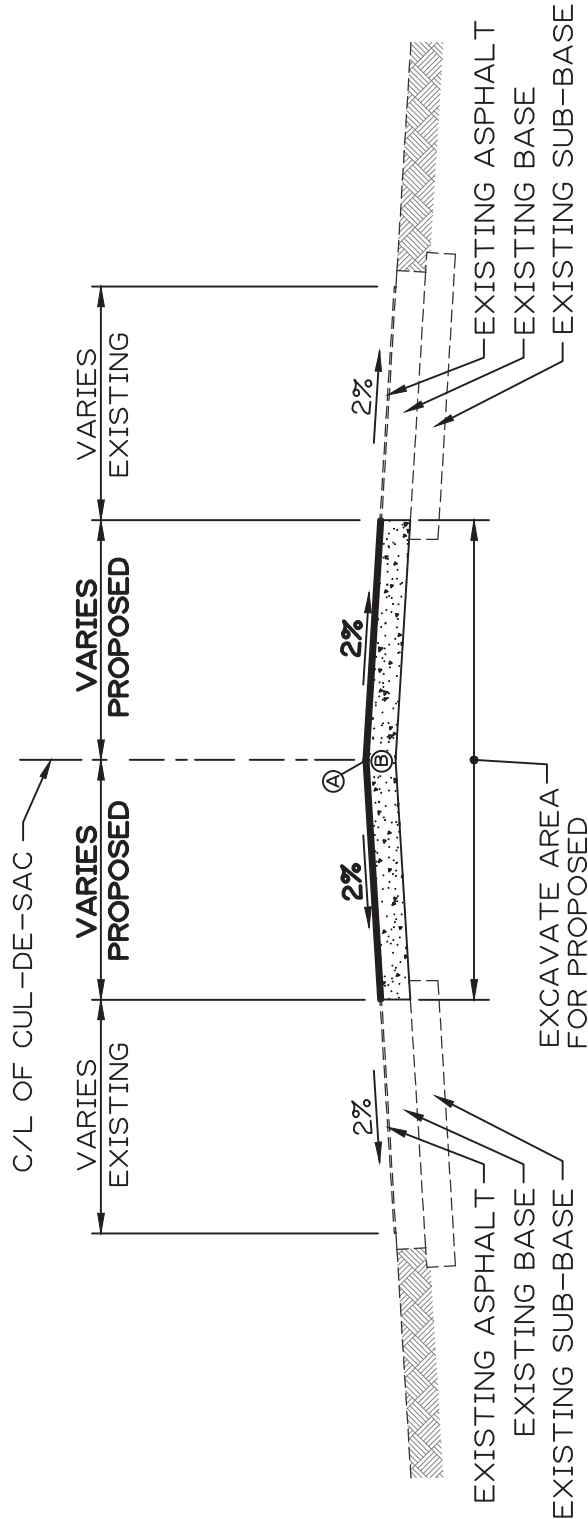


### NOTES:

1. BUILD UP SHOULDER WITH SUITABLE MATERIAL TO MEET NEW PAVEMENT SURFACE.
2. SEED AND MULCH ALL UNDEVELOPED DISTURBED AREAS.
3. SOD 2' STRIP ALONG NEW EDGE OF PAVEMENT.
4. CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS.
5. EDGE GRADE 2' STRIP ALONG EXISTING PAVEMENT.

## CUL-DE-SAC TYPICAL SECTION (N.T.S.)





④ = 3" FDOT SP-9.5 ASPHALTIC CONCRETE

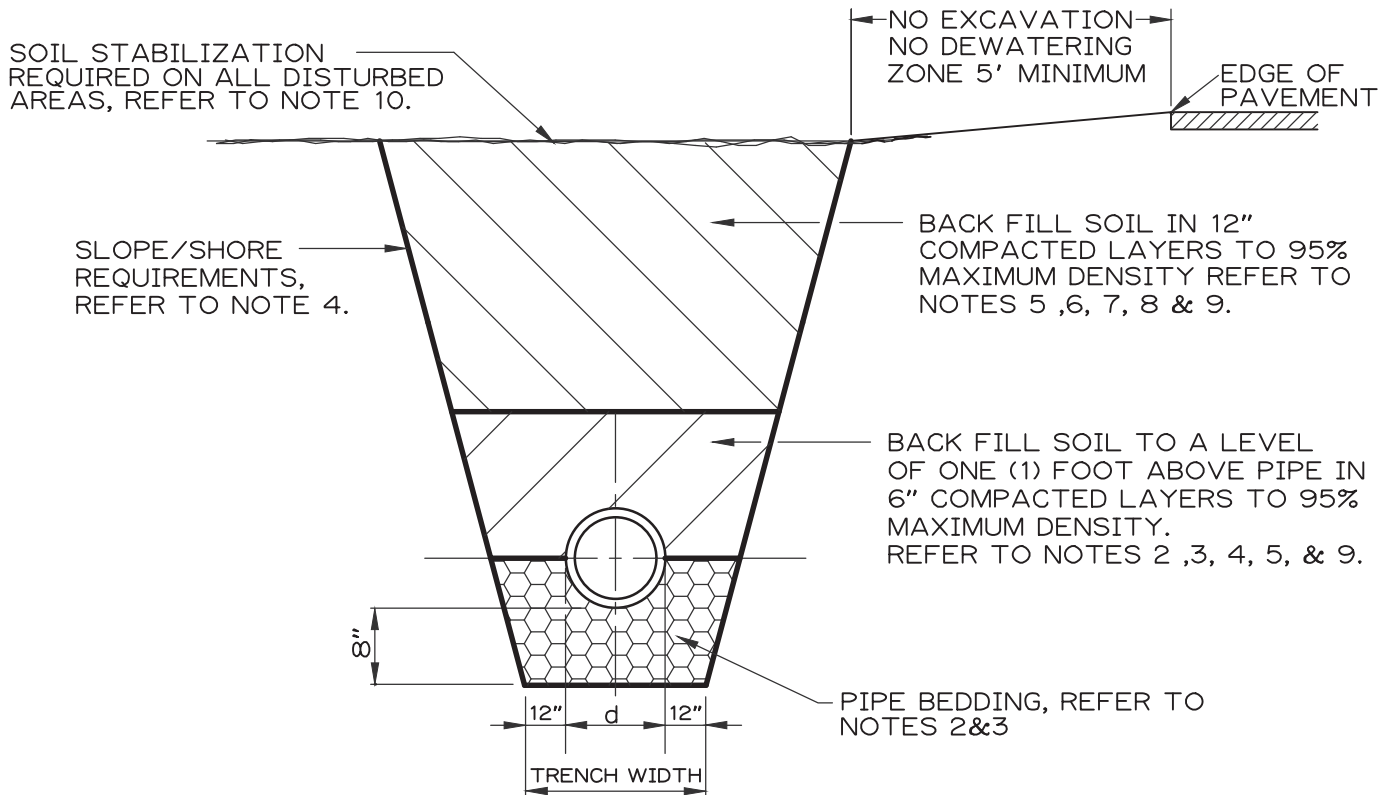
⑧ = 8" LIMEROCK OR CEMENTED COQUINA BASE, LBR 100, 98% MAX. DENSITY PER AASHTO T-180

## NOTES:

1. BUILD UP SHOULDER WITH SUITABLE MATERIAL TO MEET NEW PAVEMENT SURFACE.
2. SEED AND MULCH ALL UNDEVELOPED DISTURBED AREAS.
3. SOD 2' STRIP ALONG NEW EDGE OF PAVEMENT.
4. CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS.
5. EDGE GRADE 2' STRIP ALONG EXISTING PAVEMENT.

**CUL-DE-SAC**  
**TYPICAL SECTION**  
(N.T.S.)





#### GENERAL NOTES:

1. A 30" MINIMUM COVER SHALL BE MAINTAINED WITHIN THE RIGHTS OF WAY AND 24" WITHIN P.U. & D. EASEMENTS.
2. THE MINIMUM TRENCH WIDTH SHALL BE 24" + d AT THE BED LEVEL.
3. UTILITY OR PIPE INSTALLATION SHALL BE PLACED ON 8" MINIMUM COMPACTED SOIL BACK FILL, IF THE EXPOSED MATERIAL IS UNSUITABLE OR DISTURBED. THE PIPE BED BACK FILL SOIL SHALL BE COMPACTED TO 95% MAXIMUM DENSITY, AS PER AASHTO T180 D METHOD. 3/4" ROCK GRAVEL, NUMBER 57 STONE, NATURAL SAND, IMPORTED QUARRY WASTE OR A MIXTURE THEREOF MAY BE USED AS THE ALTERNATIVE TO COMPACT SOIL. SAMPLES OF THE MATERIAL SHALL BE SUBMITTED SUFFICIENTLY IN ADVANCE OF THE INTENDED USE TO ENABLE INSPECTION, TESTING AND APPROVAL OR REJECTION THEREOF. DO NOT PLACE COARSE AGGREGATE WITHIN FOUR (4) FEET OF THE ENDS OF THE TRENCH. USE NORMALLY ACCEPTED BACKFILL MATERIAL AT THE ENDS.

(CONT. ON SHEET 2)

### TRENCH DETAIL

(N.T.S.)



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

STANDARD RIGHT OF WAY  
DETAIL

SRW - 01 (1 OF 2)

DATE: APRIL 2019

APPROVED: \_\_\_\_\_



(CONT. FROM SHEET 1)

**GENERAL NOTES:**

4. USE OF A SLOPE TRENCH WALL, TRENCH BOX, SHEETING OR SHORING SHALL MEET FLORIDA DEPARTMENT OF TRANSPORTATION AND OCCUPATIONAL SAFETY HEALTH ACT GUIDELINES.
5. CONSTRUCTION SHALL BE ACCOMPLISHED ONLY IN A DRY TRENCH. NO DEWATERING WITHIN 5' OF THE EDGE OF PAVEMENT.
6. BACKFILL SOILS SHALL BE COMPACTED IN 12" LAYERS (MAX.) TO 95% MAXIMUM DENSITY, AS PER AASHTO T180 D METHOD. COMPACTION SHALL BE ACCOMPLISHED BY SUITABLE EQUIPMENT SPECIFICALLY DESIGNED FOR THIS PURPOSE.
7. IN PLACE DENSITY TESTING SHALL BE IN ACCORDANCE WITH AASHTO-T 310-06.
8. DENSITY TEST SHALL BE ACCEPTED ON STABILIZED, NON-YIELDING SURFACES ONLY.
9. FLOWABLE BACKFILL MAY BE USED AS AN ALTERNATIVE TO COMPACTED SOIL. REFER TO THE FLORIDA DEPARTMENT OF TRANSPORTATION 2000 EDITION OF STANDARD SPECIFICATION FOR ROAD AND BRIDGE CONSTRUCTION, SECTION 121-FLOWABLE FILL, SUBSECTIONS 121-1 THROUGH 121-6, OR MOST CURRENT EDITION FOR THIS APPLICATION.
10. DISTURBED SURFACE AREAS SHALL BE STABILIZED BY THE USE OF MATCHING SOD IN FRONT OF DEVELOPED AREAS OR THE USE OF SEED AND MULCH IN ACCORDANCE WITH FDOT INDEX 105. SEED GERMINATION SHALL BE 80% OR GREATER. IF THE SLOPE EXCEEDS 3 TO 1 THEN SOD SHALL BE USED.
11. OTHER CONDITIONS MAY APPLY REFER TO THE PALM BAY CODE OF ORDINANCES FOR ADDITIONAL DETAILS.



**CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT**

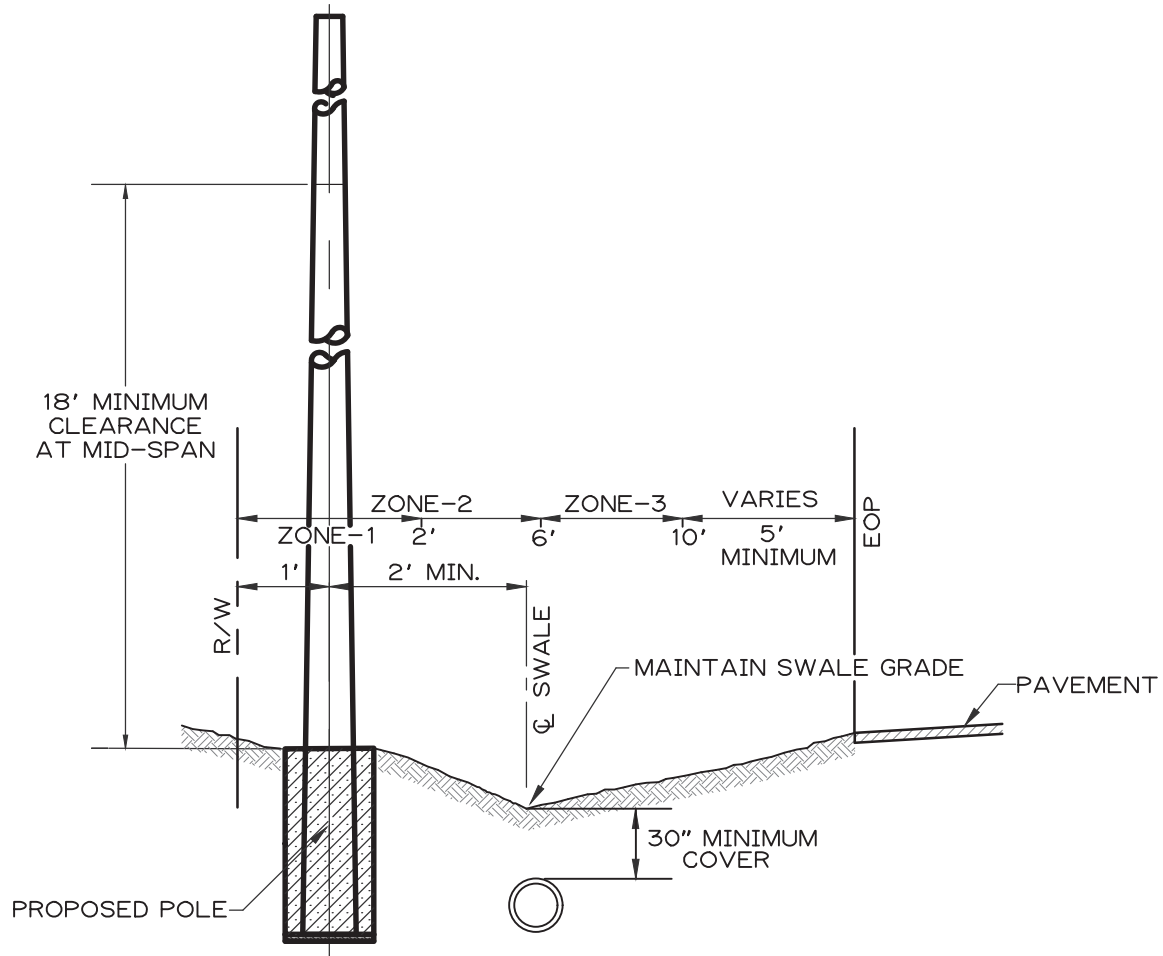
**STANDARD RIGHT OF WAY  
DETAIL**

**SRW - 01 (2 OF 2)**

DATE: APRIL 2019

APPROVED: \_\_\_\_\_





#### GENERAL NOTES:

1. ELECTRIC, TELECOMMUNICATIONS, AND CATV CABLE PLANT IMPROVEMENTS SHALL BE LOCATED IN:  
 ZONE 1 – AERIAL IMPROVEMENTS  
 ZONE 2 – UNDERGROUND IMPROVEMENTS
2. WATER, SEWER AND NATURAL GAS IMPROVEMENTS SHALL BE LOCATED IN  
 ZONE 3
3. AERIAL IMPROVEMENTS SHALL HAVE A MINIMUM CLEARANCE OF EIGHTEEN (18) FEET ABOVE EXISTING GRADE, AT MID-SPAN.
4. UNDERGROUND IMPROVEMENTS SHALL BE A MINIMUM OF THIRTY (30) INCHES BELOW THE EXISTING GRADE.
5. UNDERGROUND IMPROVEMENTS SHALL HAVE A MINIMUM SEPARATION OF TWELVE (12) INCHES FROM OTHER STRUCTURES.
6. EXCAVATION SHALL NOT BE PERMITTED WITHIN FIVE (5) FEET OF THE EDGE OF PAVEMENT.
7. OTHER CONDITIONS MAY APPLY, REFER TO THE PALM BAY CODE OF ORDINANCES FOR ADDITIONAL DETAILS.

### UTILITY LOCATION DETAIL

(N.T.S.)



**CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT**

**STANDARD RIGHT OF WAY  
DETAIL**

**SRW - 02**

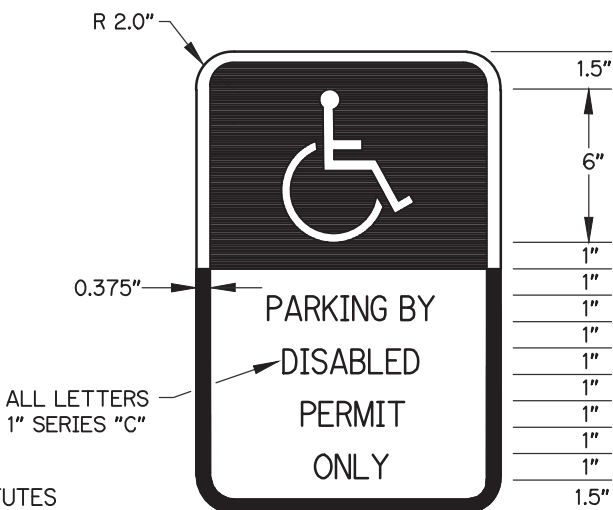
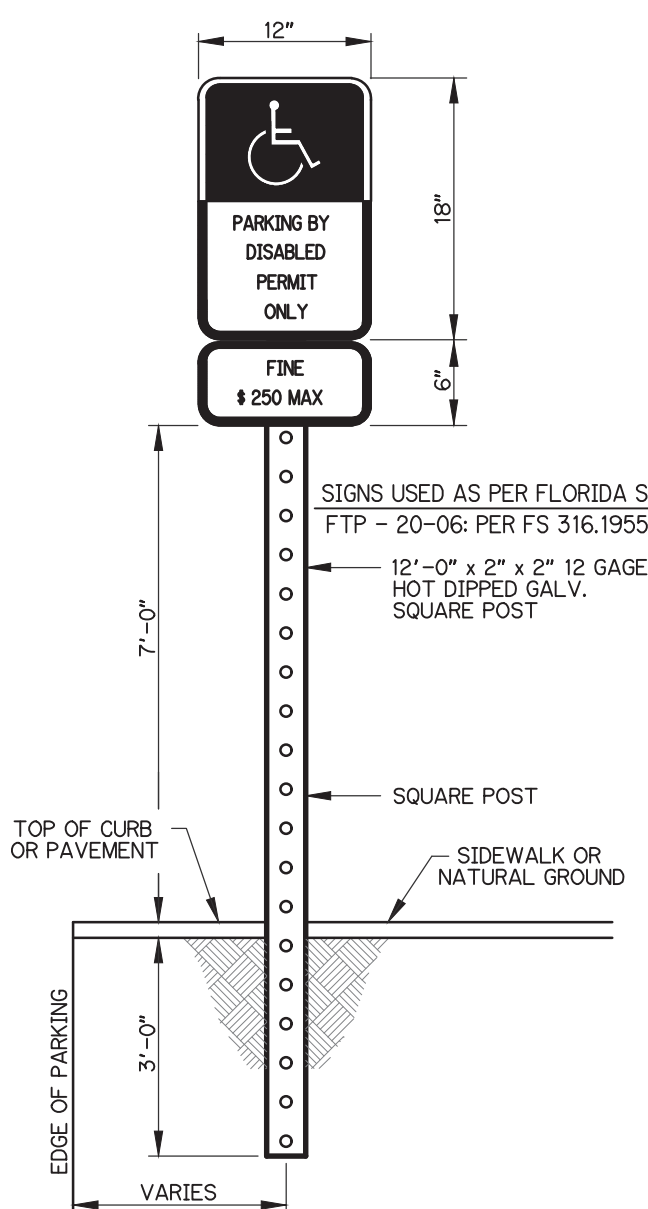
DATE: APRIL 2019

APPROVED: \_\_\_\_\_

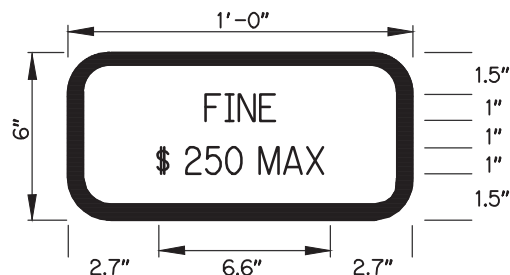








**FTP - 20-06**



**FTP - 22-06**

1' x 6"  
1" RADII 3/8" BORDER  
1" SERIES C LETTERS  
WHITE BACKGROUND  
BLACK LEGEND & BORDER

### GENERAL NOTES:

1. TOP PORTION OF FTP-20-06 SHALL HAVE A REFLECTIVE BLUE BACKGROUND WITH WHITE REFLECTIVE SYMBOL AND BORDER.
2. BOTTOM PORTION OF FTP-20-06 SHALL HAVE A REFLECTIVE WHITE BACKGROUND WITH BLACK OPAQUE LEGEND AND BORDER.
3. THE SIGN SHALL BE PLACED A MINIMUM OF 3' FROM THE WHEEL STOP OR THE BACK OF CURB (WHERE APPLICABLE).

## HANDICAPPED PARKING SIGN INSTALLATION DETAIL



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

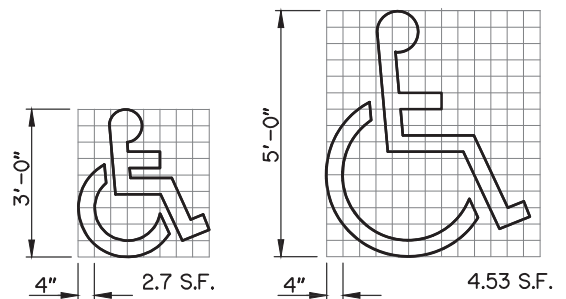
STANDARD SIGN DETAIL

SS - 02

DATE: APRIL 2019

APPROVED: \_\_\_\_\_

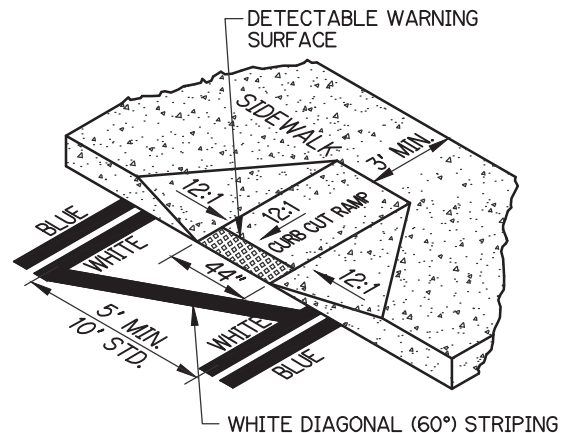




USE OF PAVEMENT SYMBOL IN HANDICAPPED PARKING SPACES IS OPTIONAL. WHEN USED THE SYMBOL SHALL BE 3 OR 5 FT HIGH AND WHITE IN COLOR.

The diagram illustrates the layout and dimensions of a curb cut ramp. Key features include:

- Labels:** CURB CUT RAMP, SIGN FTP-20-06 & FTP-22-006, SIDEWALK, 6" WHITE, 90°, OR 16' W/3' OVERHANG, MIN., WHITE, BLUE, 6", 2", 6".
- Dimensions:** 10', 10', 12', 5', 12', 10', 10', 19', 6", 2", 6".
- Colors:** WHITE, BLUE.
- Signs:** SIGN FTP-20-06 & FTP-22-006.
- Other:** 6" WHITE, 90°, OR 16' W/3' OVERHANG, MIN., WHITE, BLUE, 6", 2", 6".



APPROVED: \_\_\_\_\_





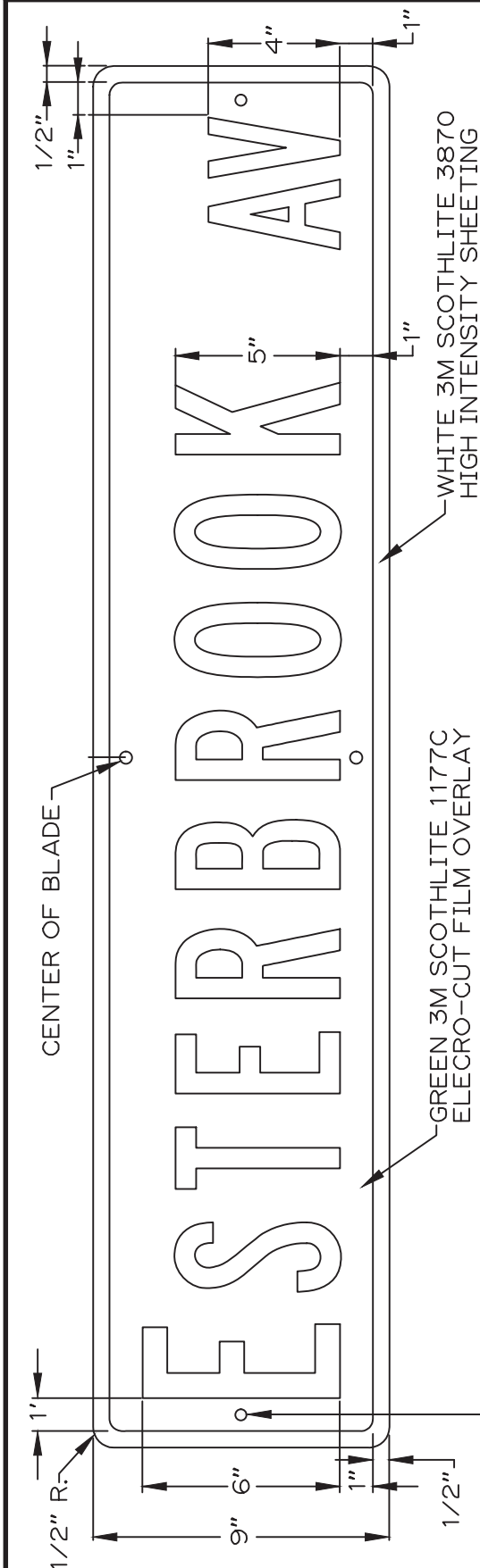
CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

STANDARD SIGN DETAIL

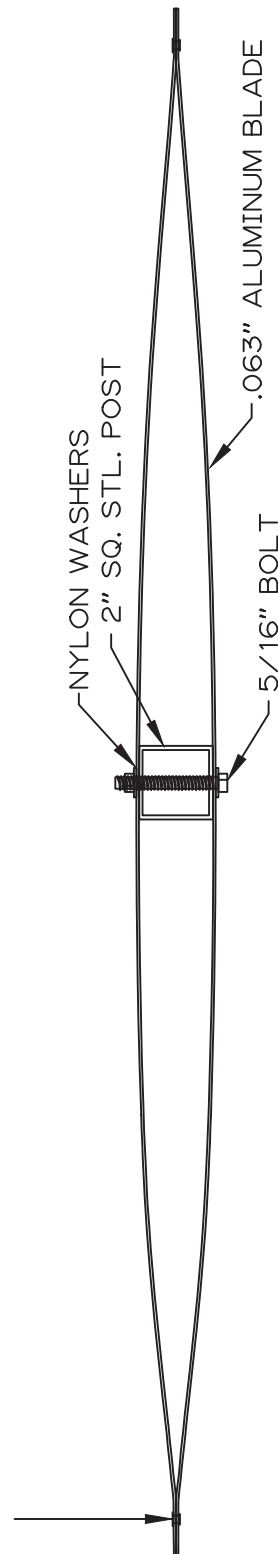
SS - 04

DATE: APRIL 2019

APPROVED: \_\_\_\_\_



## FRONT VIEW BLADE DETAIL



## TOP VIEW BLADE DETAIL

### NOTES:

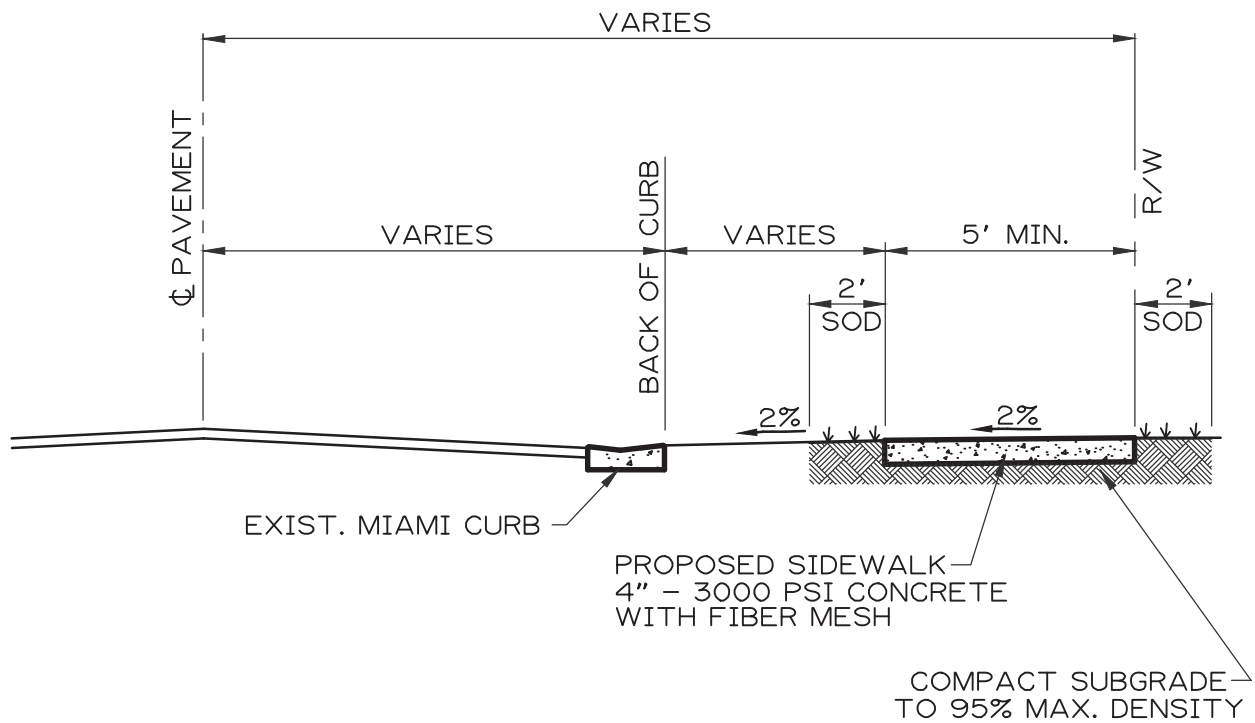
1. ALUMINUM BLADES SHALL BE COVERED WITH "WHITE" 3M SCOTHLITE 3070 SERIES HIGH INTENSITY SHEETING (FIRST LAYER) WITH AN OVERLAY OF "GREEN" 3M SCOTHLITE 1177C ELECTRO-CUT FILM (SECOND LAYER)
2. LENGTH OF BLADES SHALL BE ONE OF FOLLOWING: 24", 30", 36", 42", OR 48"
3. ALL ALUMINUM BLADES HAVE A THICKNESS OF 0.063" AND ATTACHED AT ENDS WITH ALUMINUM RIVETS WITH BLADES FACING BACK TO BACK TO SLIDE OVER POSTS.
4. FONTS USED ARE "HIGHWAY B" ALL CAPITALS. FIRST CAP IS 6", THEN 5", THEN ABBREVIATION AT END IS 4". SPACING (KERNING) ON FONTS IS A VISUAL FOR READABILITY.
5. CHARACTERS ON BLADES MAX PER BLADE SIZE WITHOUT LOGO 24" (7), 30' (9), 36" (11), 42" (13), 48" (MAKE FIT).
6. DO NOT CONDENSE CHARACTERS WIDTH EXCEPT UNDER EXTREME CONDITIONS ON 48" BLADE.

ABBREVIATIONS FOR BLADES	
AVENUE	AV
BOULEVARD	BL
CIRCLE	CIR
COURT	CT
DRIVE	DR
HIGHWAY	HWY
LANE	LN
PARKWAY	PKWY
ROAD	RD
STREET	ST
TRAIL	TR
TERRACE	TER
WAY	WAY
LANE	LN



ABBREVIATIONS FOR BLADES	
AVENUE	AV
BOULVARD	BL
CIRCLE	CIR
COURT	CT
DRIVE	DR
HIGHWAY	HWY
LANE	LN
PARKWAY	PKWY
ROAD	RD
STREET	ST
TRAIL	TR
TERRACE	TER
WAY	WAY
LANE	LN





## STANDARD CONCRETE SIDEWALK SECTION W/MIAMI CURB

(N.T.S.)



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

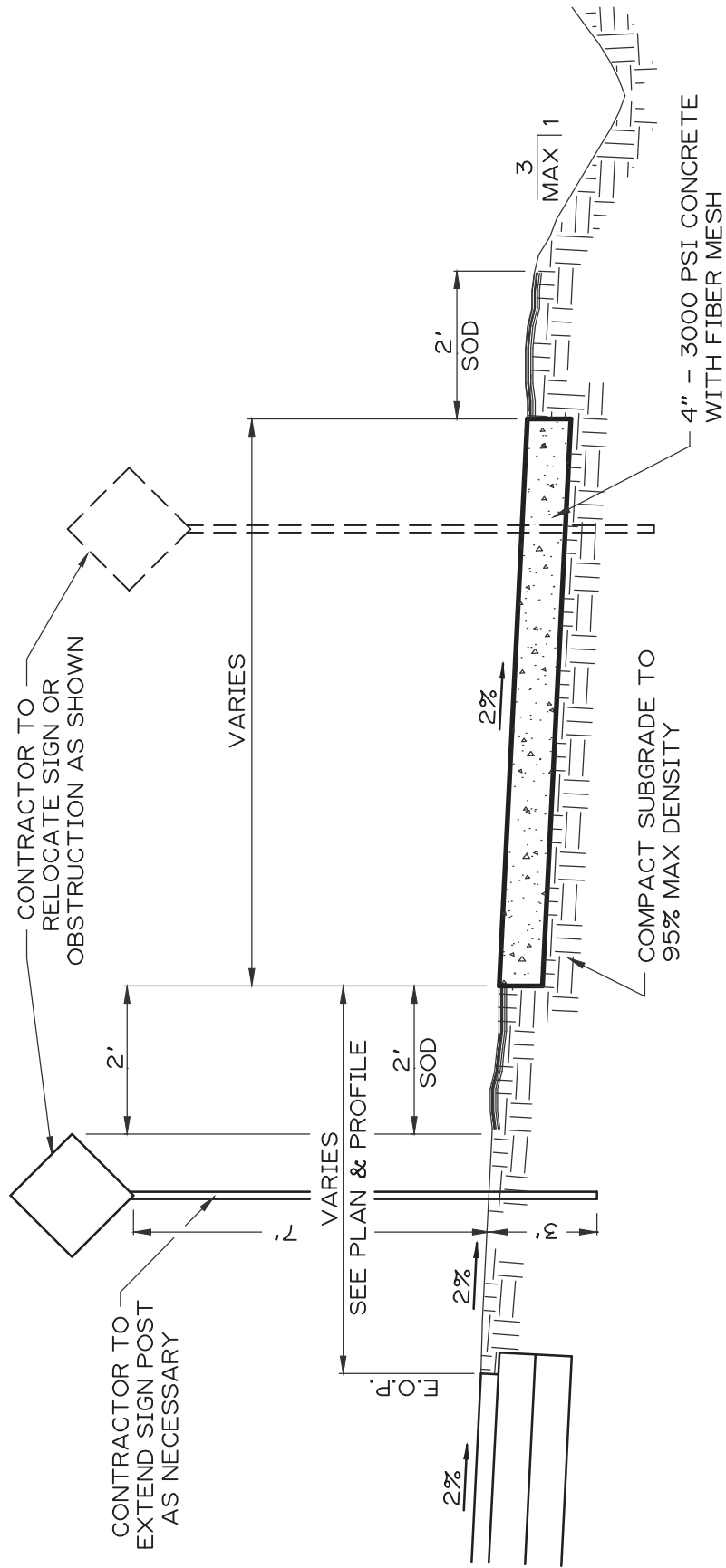
STANDARD SIDEWALK DETAIL

SW - 01

DATE: APRIL 2019

APPROVED: \_\_\_\_\_





# **STANDARD CONCRETE SIDEWALK SECTION**

(N.T.S.)



**CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT**

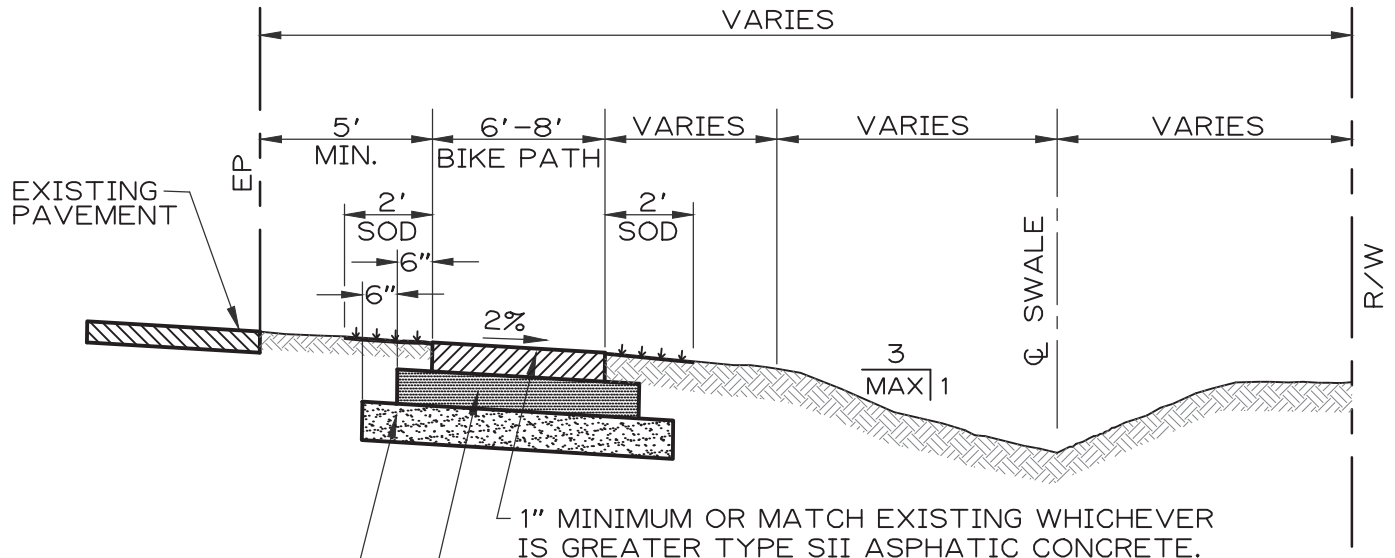
**STANDARD SIDEWALK DETAIL**

**SW - 02**

DATE: APRIL 2019

APPROVED: \_\_\_\_\_





1" MINIMUM OR MATCH EXISTING WHICHEVER IS GREATER TYPE SII ASPHATIC CONCRETE.

8" OF LIMEROCK OR COQUINA BASE. COMPACTED TO A 95% MAX. DENSITY AS PER AASHTO T-180 D METHOD. THE LIMEROCK OR COQUINA BASE MATERIAL SHALL HAVE A MINIMUM LIMEROCK BEARING RATIO (LBR) OF 100.

THE SUBGRADE SHALL BE DRY AND NON-YIELDING. ANY ORGANIC OR OTHER DELETERIOUS MATERIAL SHALL BE REMOVED DURING THE GRADING PROCESS. THE COMPACTION SHALL BE A MINIMUM OF 95% MAX. DENSITY AS PER AASHTO T-180 D METHOD. THE STABILIZED SUBGRADE SHALL HAVE A MINIMUM LIMEROCK BEARING RATIO-(LBR) OF 40.

#### GENERAL NOTES:

1. ALL SAW CUTS SHALL BE AT RIGHT ANGLES TO THE BIKEWAY/SIDEWALK CENTER LINE.
2. THE MINIMUM EDGE OF BIKEWAY/SIDEWALK REPAIR WIDTH SHALL BE ONE (1) FOOT.
3. REMOVE ACCUMULATED DEBRIS FROM THE SITE AND DISPOSE OF IN A LAWFUL MANNER.
4. STABILIZE THE DISTURBED AREAS ABUTTING THE BIKEWAY/SIDEWALK WITH A MINIMUM TWO (2) FOOT WIDE STRIP OF MATCHING SOD.

### **6'-8' ASPHALT BIKE PATH DETAIL**

(N.T.S.)



**CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT**

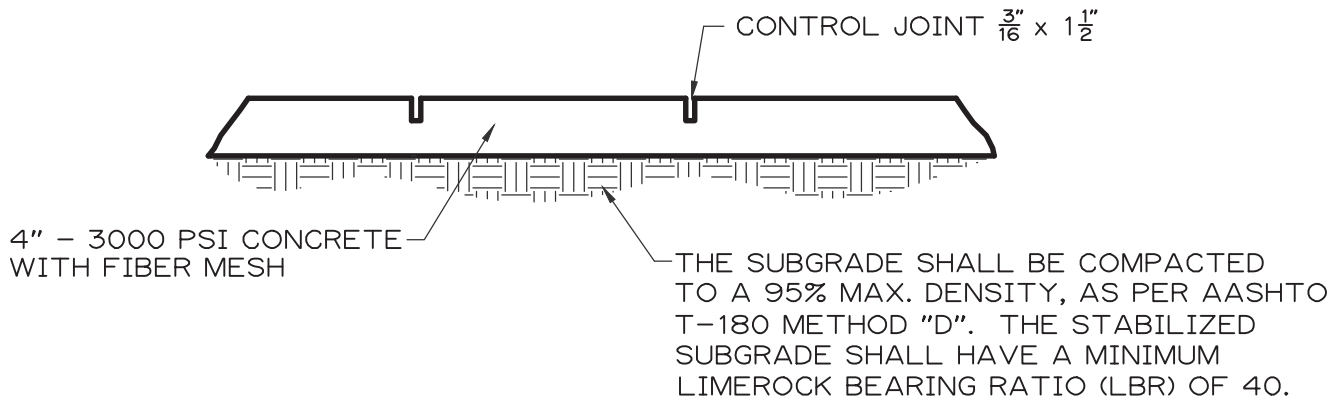
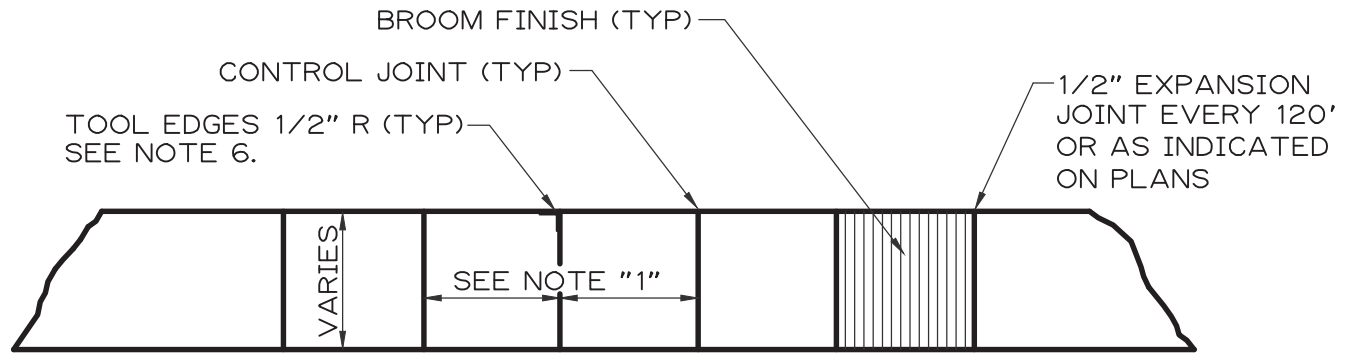
**STANDARD SIDEWALK DETAIL**

**SW - 03**

DATE: APRIL 2019

APPROVED: \_\_\_\_\_





#### GENERAL NOTES:

1.

	SIDEWALK		BIKEWAY	
WIDTH	4'	5'	6'	8'
CONTROL JOINT	5'		8'	
2. ALL SAWCUTS TO BE MADE AT A CONTROL JOINT.
3. THE MINIMUM BIKEWAY/SIDEWALK REPAIR SHALL BE ONE FULL SECTION BETWEEN CONTROL JOINTS.
4. REMOVE ACCUMULATED DEBRIS FROM THE SITE AND DISPOSE OF IN A LAWFUL MANNER.
5. STABILIZE THE DISTURBED AREAS ABUTTING THE BIKEWAY/SIDEWALK WITH A MINIMUM TWO (2) FOOT WIDE STRIP OF MATCHING SOD.
6. TOOL EDGES SHALL BE USED WHERE EXISTING SIDEWALKS HAVE BEEN CONSTRUCTED WITH SIMILAR FINISHES.
7. EXPANSION JOINT MATERIAL REQUIRED AROUND ALL MANHOLES AND STRUCTURES.

### CONCRETE BIKEWAY/SIDEWALK TOOLING DETAIL

(N.T.S.)



**CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT**

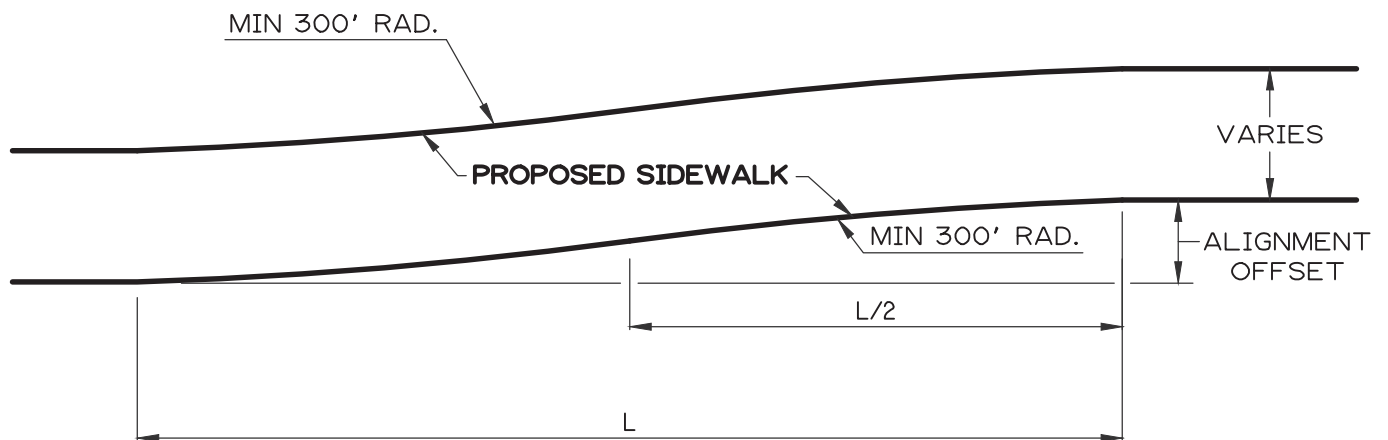
**STANDARD SIDEWALK DETAIL**

**SW - 04**

DATE: APRIL 2019

APPROVED: \_\_\_\_\_





REVERSE CURVE LENGTH VARIES  
(78' FOR 5' OFFSET)

## HORIZONTAL SIDEWALK ALIGNMENT

(N.T.S.)



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

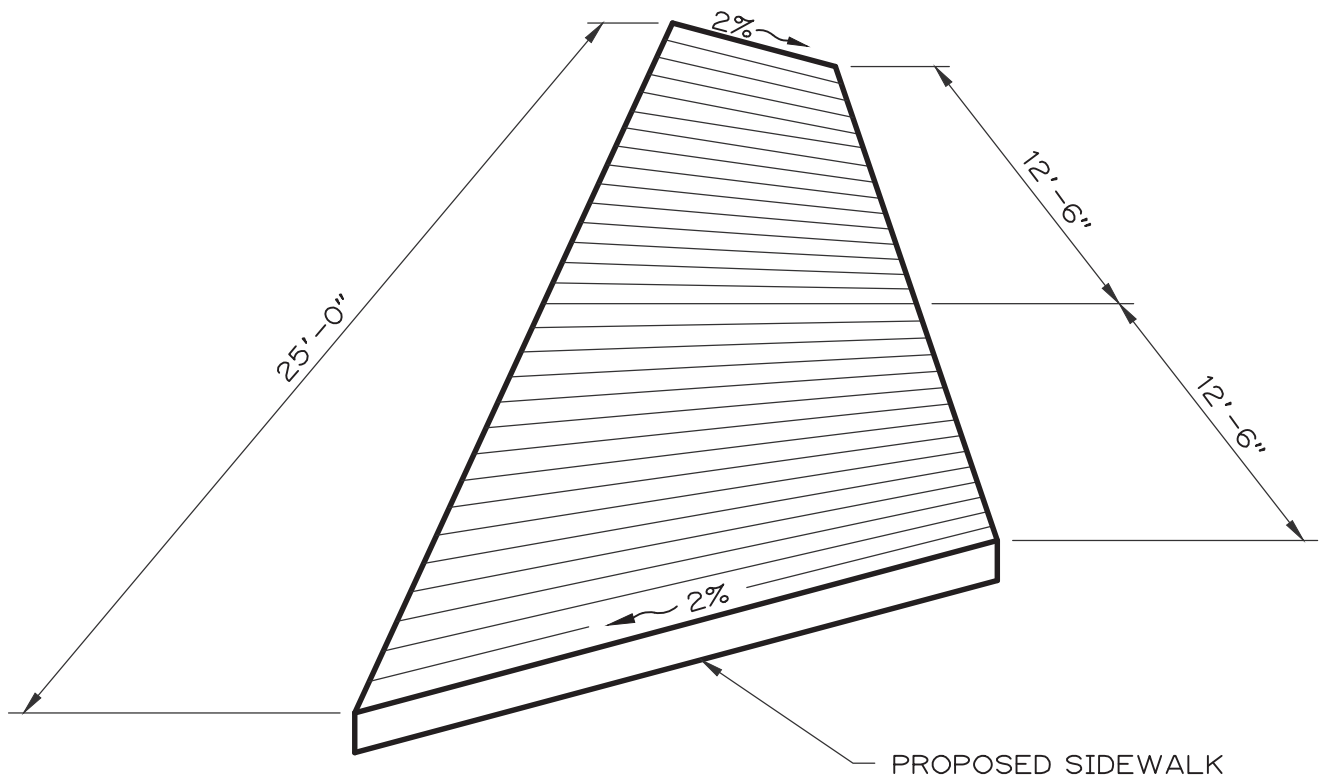
STANDARD SIDEWALK DETAIL

SW - 05

DATE: APRIL 2019

APPROVED: \_\_\_\_\_





**REVERSE CROSS SLOPE TRANSITION DETAIL**  
(N.T.S.)



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

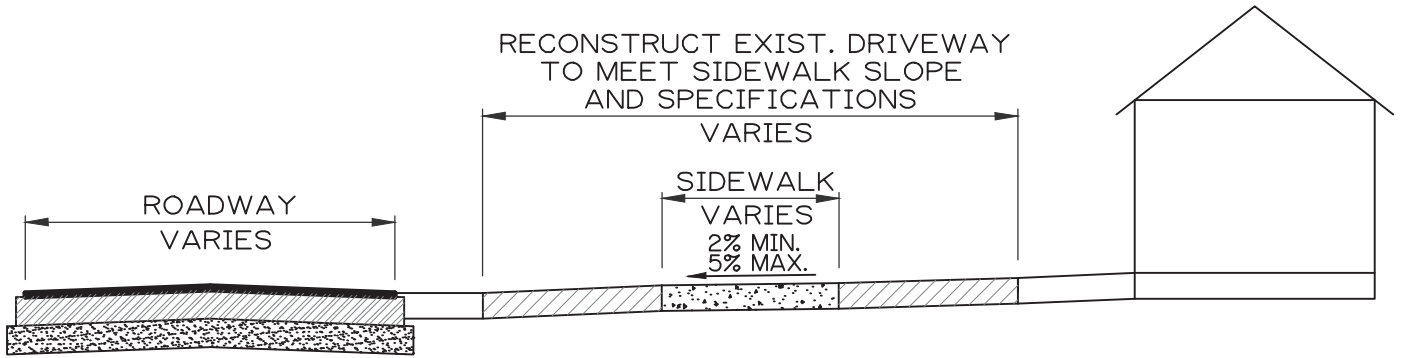
STANDARD SIDEWALK DETAIL

SW - 06

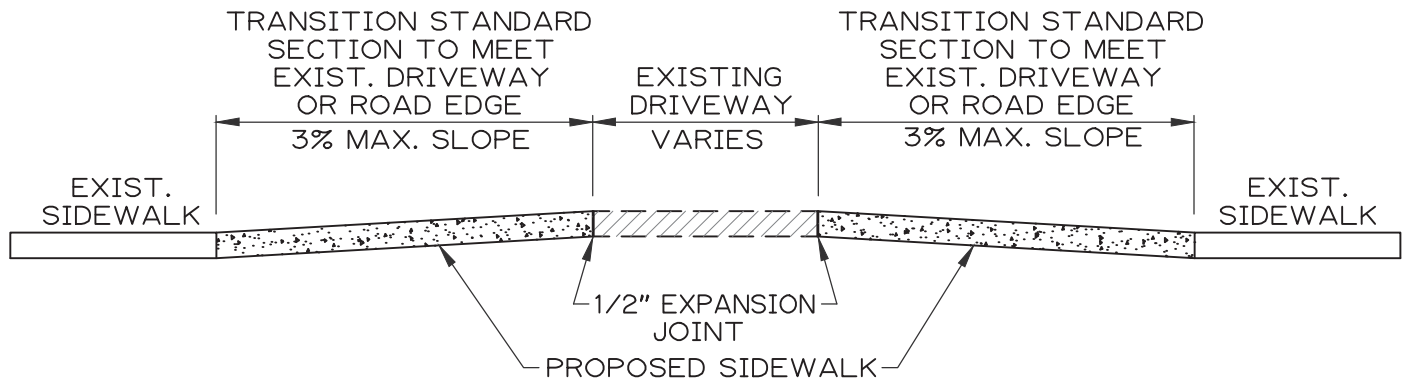
DATE: APRIL 2019

APPROVED: \_\_\_\_\_





### SIDEWALK SECTION AT DRIVEWAY



### SIDEWALK PROFILE AT DRIVEWAY

#### NOTES:

1. SIDEWALK EITHER 4" – 3000 PSI WITH FIBER MESH CONCRETE OR 1" ASPHALT W/8" COQUINA OR LIMEROCK.
2. SIDEWALK LOCATION TO BE DETERMINED BY THE CITY OF PALM BAY PUBLIC WORKS DEPARTMENT.
3. 3% MAX. SLOPE (BOTH APPROACHES) UNLESS APPROVED BY THE CITY OF PALM BAY PUBLIC WORKS DEPARTMENT.
4. SIDEWALKS ADJOINING DRIVEWAYS 24 FEET OR WIDER, RIGHT IN / RIGHT OUT DRIVEWAYS AND SIDE ROADS AND STREETS SHALL HAVE A DETECTABLE WARNING SURFACE THAT EXTENDS THE FULL WIDTH OF THE SIDEWALK AND IN THE DIRECTION OF TRAVEL 24" FROM THE EDGE OF THE DRIVEWAYS AND FROM THE EDGE OF SIDE ROADS AND STREETS. FOR SIDEWALKS CONTINUOUS THROUGH DRIVEWAYS, DETECTABLE WARNING SURFACES ARE NOT REQUIRED.

### SIDEWALK AT DRIVEWAY / ROAD CROSSING DETAIL

(N.T.S.)



**CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT**

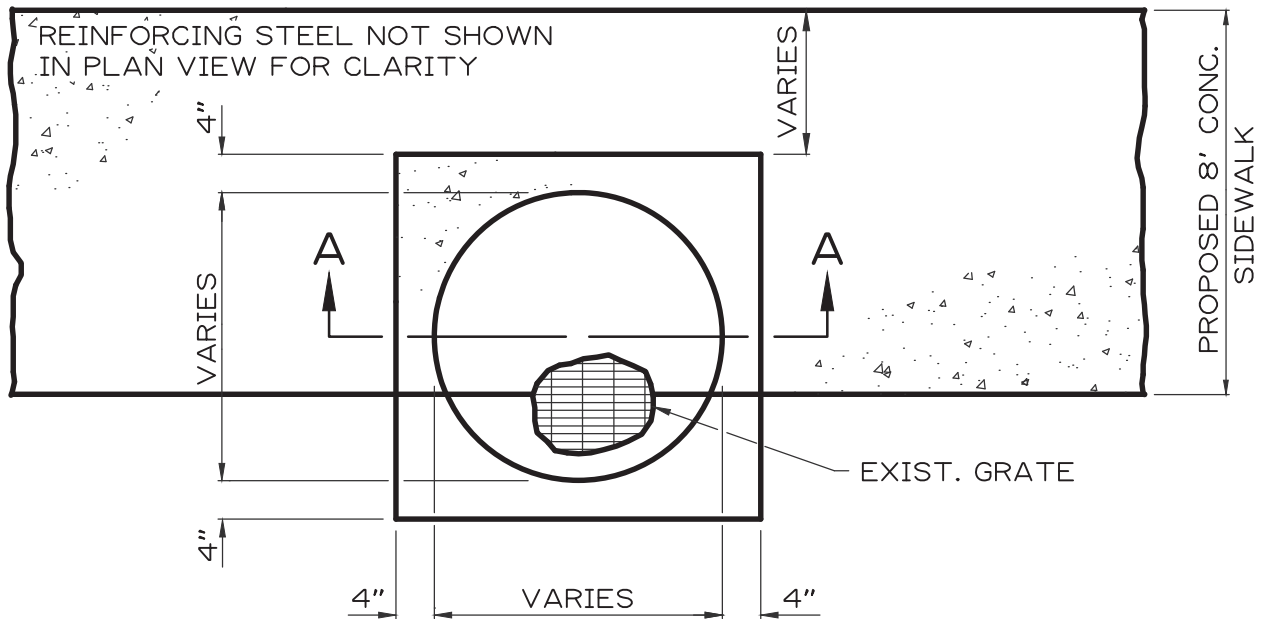
**STANDARD SIDEWALK DETAIL**

**SW – 07**

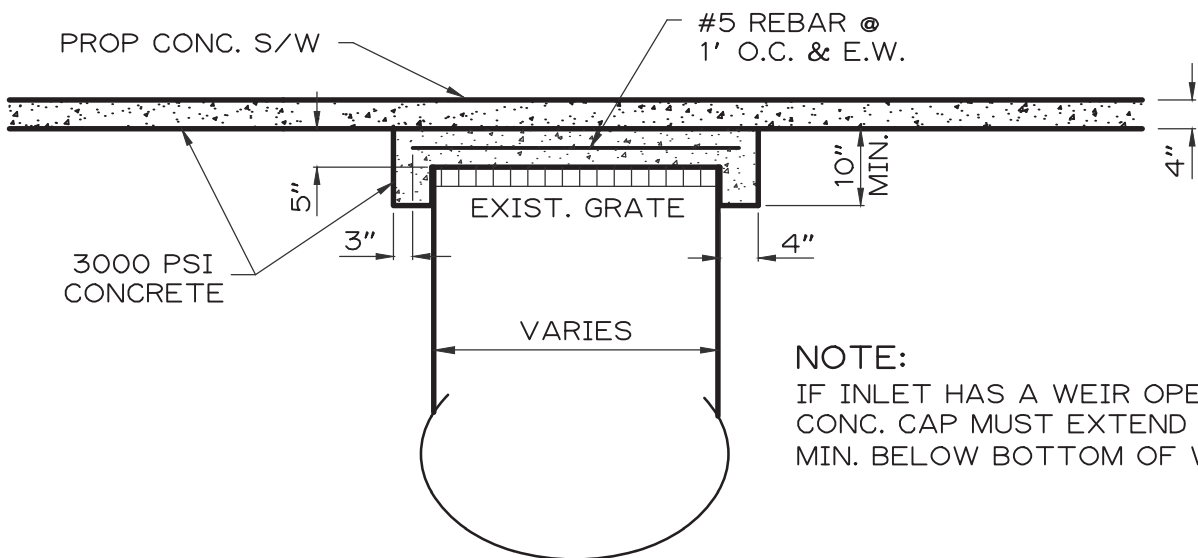
DATE: APRIL 2019

APPROVED: \_\_\_\_\_





PLAN VIEW



SECTION A-A

TYPICAL CONCRETE CAPPING DETAIL

(N.T.S.)



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

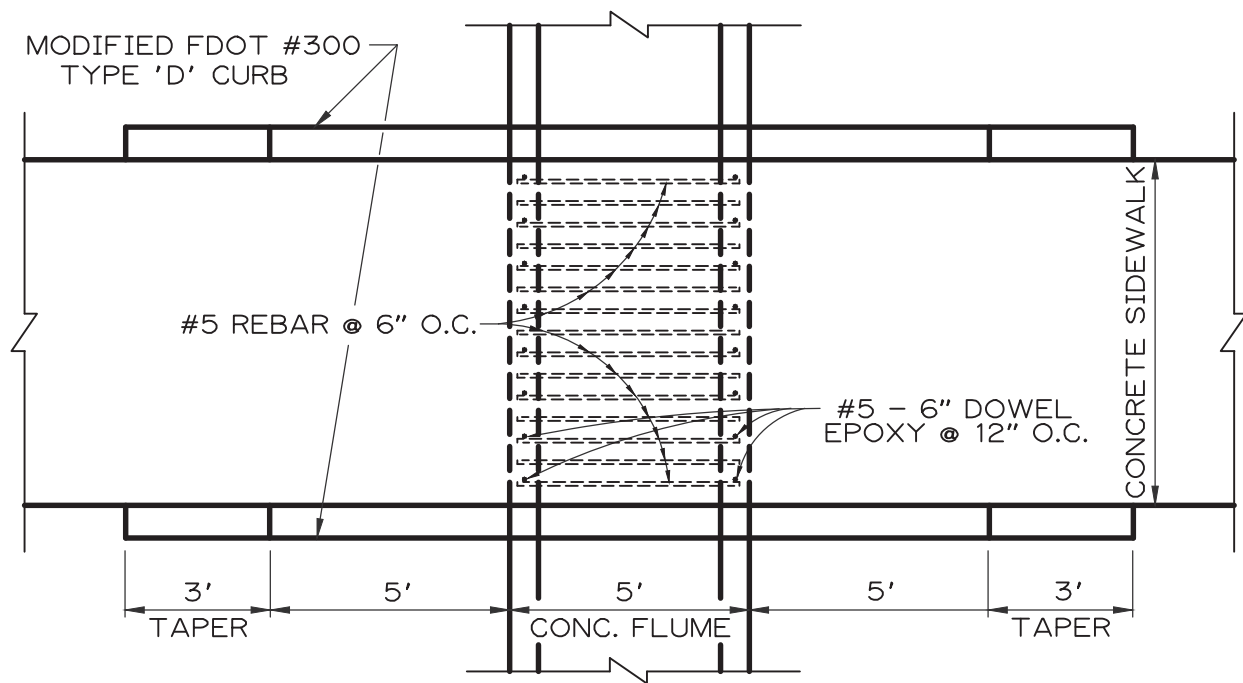
STANDARD SIDEWALK DETAIL

SW - 08

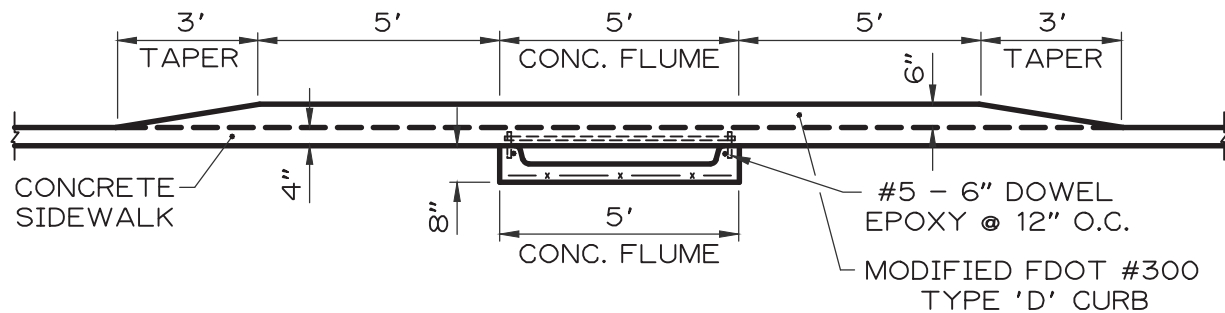
DATE: APRIL 2019

APPROVED: \_\_\_\_\_

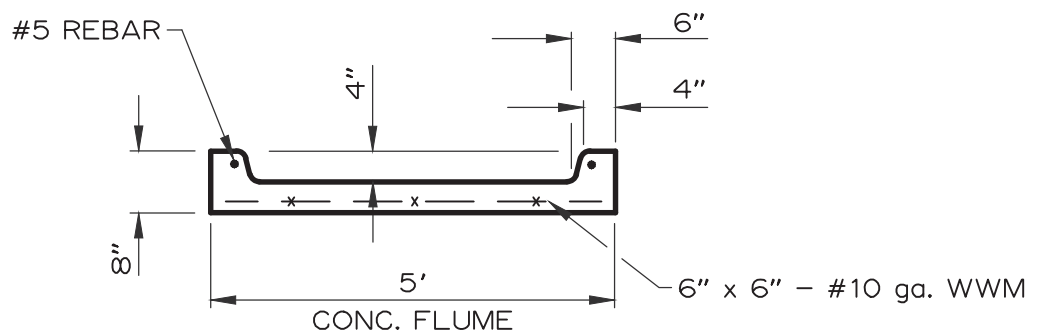




PLAN VIEW



SECTION VIEW



FLUME DETAIL

## SIDEWALK BRIDGE OVER CONCRETE FLUME

(N.T.S.)



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

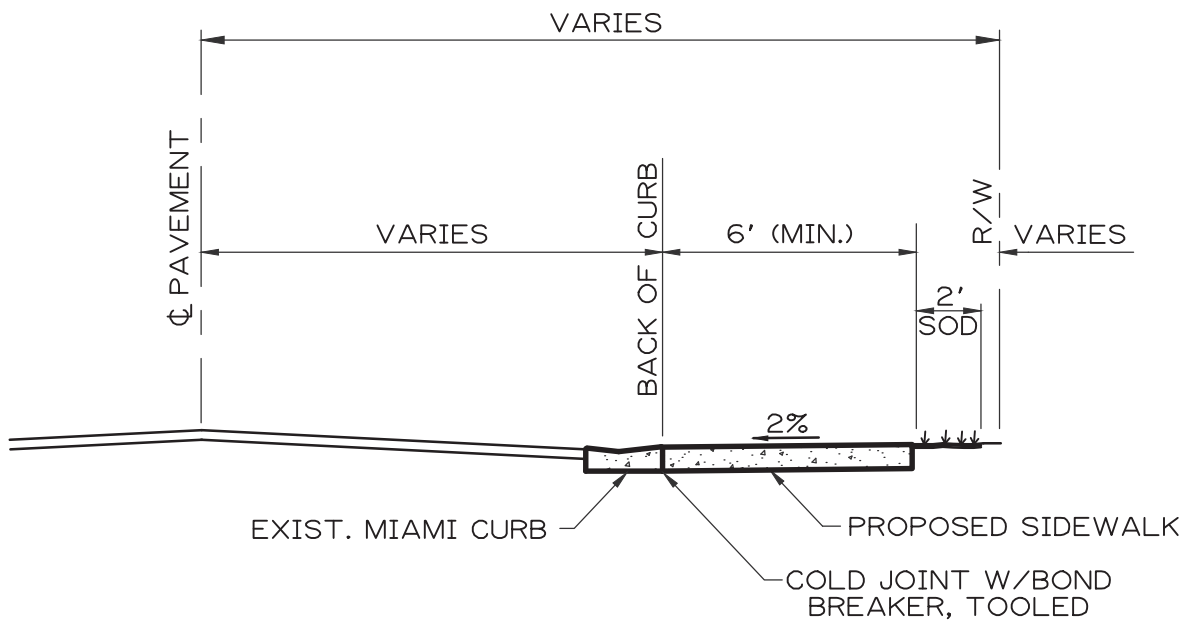
STANDARD SIDEWALK DETAIL

SW - 09

DATE: APRIL 2019

APPROVED: \_\_\_\_\_





ADJACENT TO THE BACK OF CURB

**STANDARD CONCRETE SIDEWALK SECTION**  
**ADJACENT TO MIAMI CURB**

(N.T.S.)



CITY OF PALM BAY  
PUBLIC WORKS DEPARTMENT

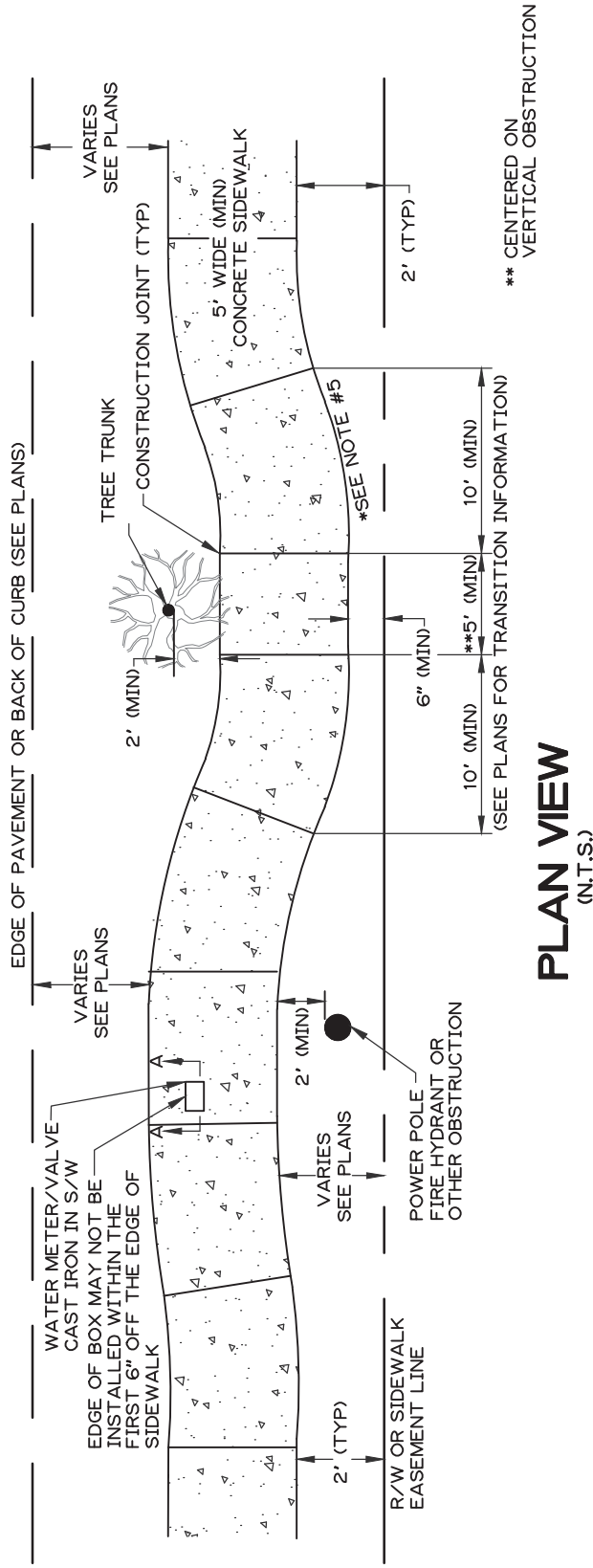
STANDARD SIDEWALK DETAIL

SW - 10

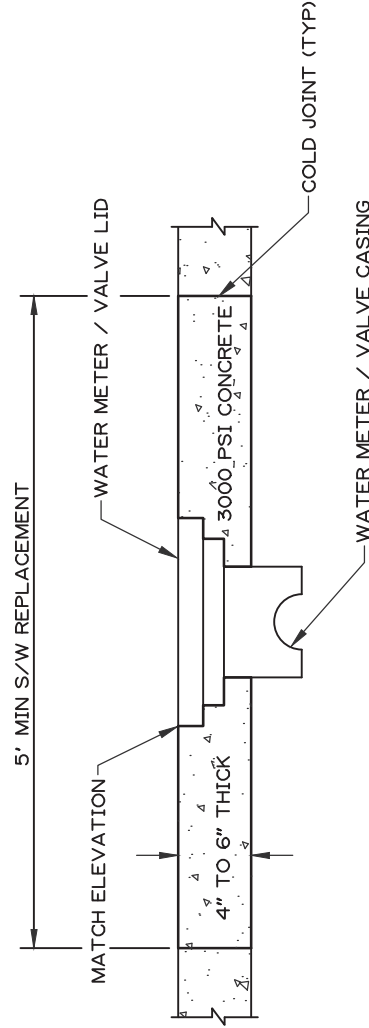
DATE: APRIL 2019

APPROVED: \_\_\_\_\_





**PLAN VIEW**  
(N.T.S.)



# SECTION A-A (N.T.S.)

## SIDEWALK ALIGNMENT

NOTÈ:

1. ADJUST SIDEWALK TO AVOID OBSTRUCTION, AS SHOWN, OR AS DIRECTED BY THE ENGINEER.
2. CONSTRUCTION OF SIDEWALK SHALL MEET ADA REQUIREMENTS AS SPECIFIED IN THE FDOT INDEX NO. 515 AND NO. 304.
3. POWER POLE SHALL BE MOVED WHEN POSSIBLE.
4. TREES SHALL BE TRIMMED TO MAINTAIN VERTICAL CLEARANCE: 9 FT. FOR SIDEWALKS AND 18 FT. FOR ROADS.
5. MAXIMUM LATERAL DEFLECTION SHALL BE 5:1.
6. REMOVE TREE ROOTS WITHIN 10" OF PROPOSED GRADE.
7. CONTRACTION JOINTS SHALL MEET FDOT INDEX NO. 310.
8. APPLY DETAIL TO ACCOMMODATE M.H. CONFLICTS. COVERS TO BE REPLACED AS REQUIRED TO MAINTAIN FLUSH SURFACE AND PATTERN