Navigating FDOT Specifications and Standards

And How They Apply To Precast Concrete Pipe And Box Culverts

American **Concrete Pipe** Association

Important FDOT Documents…

- Special Provisions
- Technical Special Provisions
- Engineering plans
- Roadway Standard Indices
- Developmental Specifications
- Supplemental Specifications
- Standard Specifications

Additional FDOT Documents…

- Structures Design Guide
- Qualified Products List (QPL)
- Materials Manual
- Plant Quality Control Plan

  Developed by plants

  Subject to FDOT review / approval

Training Objectives

- Not to memorize every specification
- Focus on resources
- Learn where to find answers
- Reference
- Note: Always be familiar with contract document requirements of your job

FDOT State Specifications Office

Web Site

http://www.dot.state.fl.us/specificationsoffice/

Standard Specifications for Road and Bridge Construction (2007)

Other Versions May Govern Your Job

Specification Modifications / Workbooks

Qualified Products List (QPL)

http://www.dot.state.fl.us/specificationsoffice/QPLindex.htm

FDOT Specification Terms

Section ###

FDOT specifications are referred to as "Sections" and have a numeric designation.

Example, "Section 430."

"Contractor" – Individual, firm, joint venture, or company contracting with Dept. to perform work.

Is your company considered a "contractor" when it provides pipe for a FDOT project?

Legally, the prime contractor is the installer / contractor. FDOT is contracted with the contractor / installer. The pipe/box plant is considered to be a sub-contractor.

However, there are many references to "contractor" in the pipe/box specs. There references are directed toward the manufacturer.

FDOT Specification Terms (Continued)

- “Engineer” – FDOT Office of Construction of representative.
- “Engineer of Record” – FDOT staff engineer or contracted consultant responsible for project’s concept, analysis, and Plans and Specifications.
- “Inspector” – Authorized representative of the Engineer to make official inspections of materials and work of the contractor.

FDOT Specification Terms (Continued)

- “Materials” – Any substances incorporated in the contracted work.
- “Specialty Engineer” – Florida P.E. that designs a special component of the work. May be employee of the Contractor or fabricator, of a supplier to a fabricator, or an independent consultant.

FDOT Specification Terms (Continued)

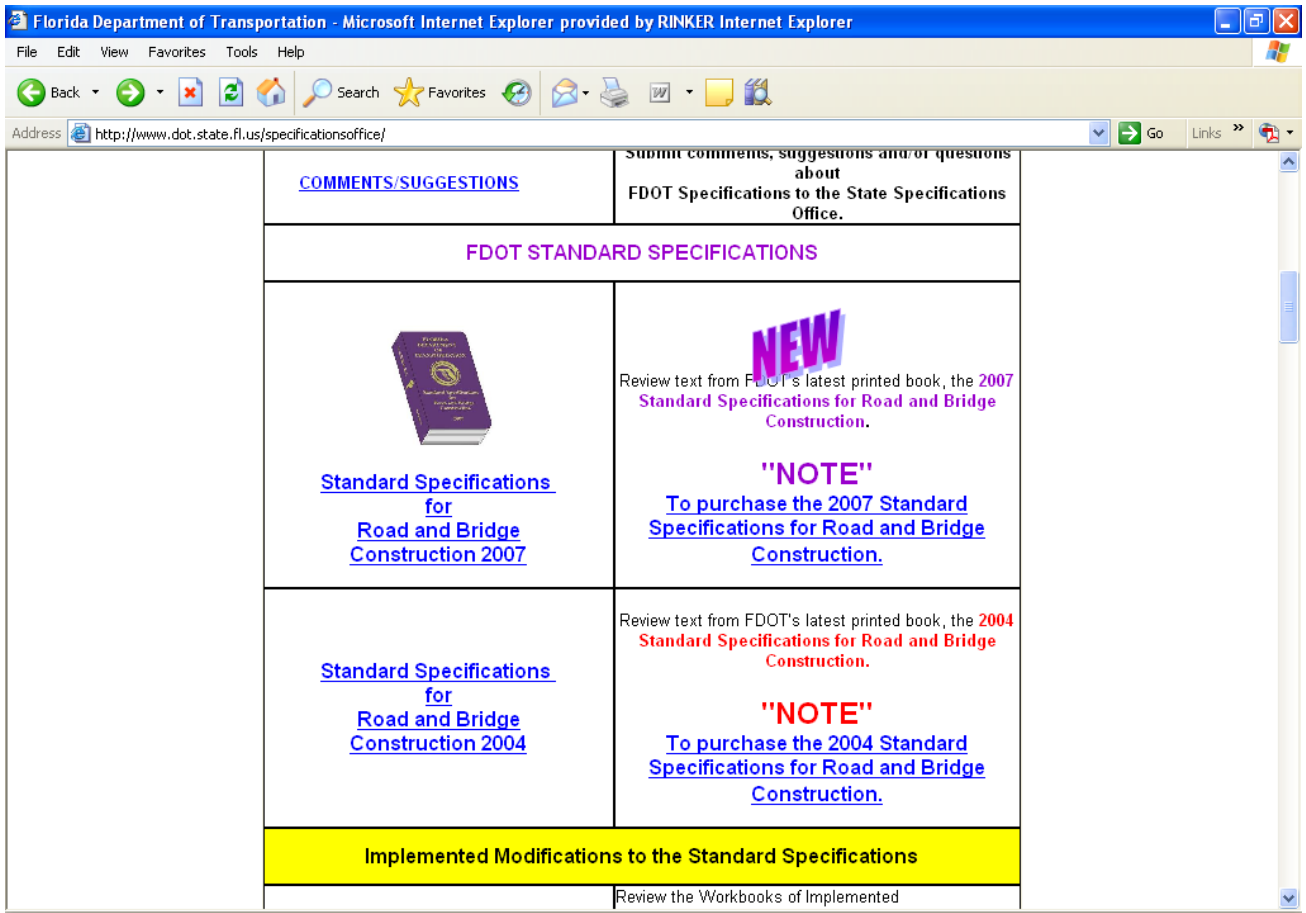
- “Standard Specifications” – Applicable to all Contracts.
- “Supplemental Specifications” – Approved additions / revisions, applicable to all Contracts.

FDOT Specification Terms (Continued)

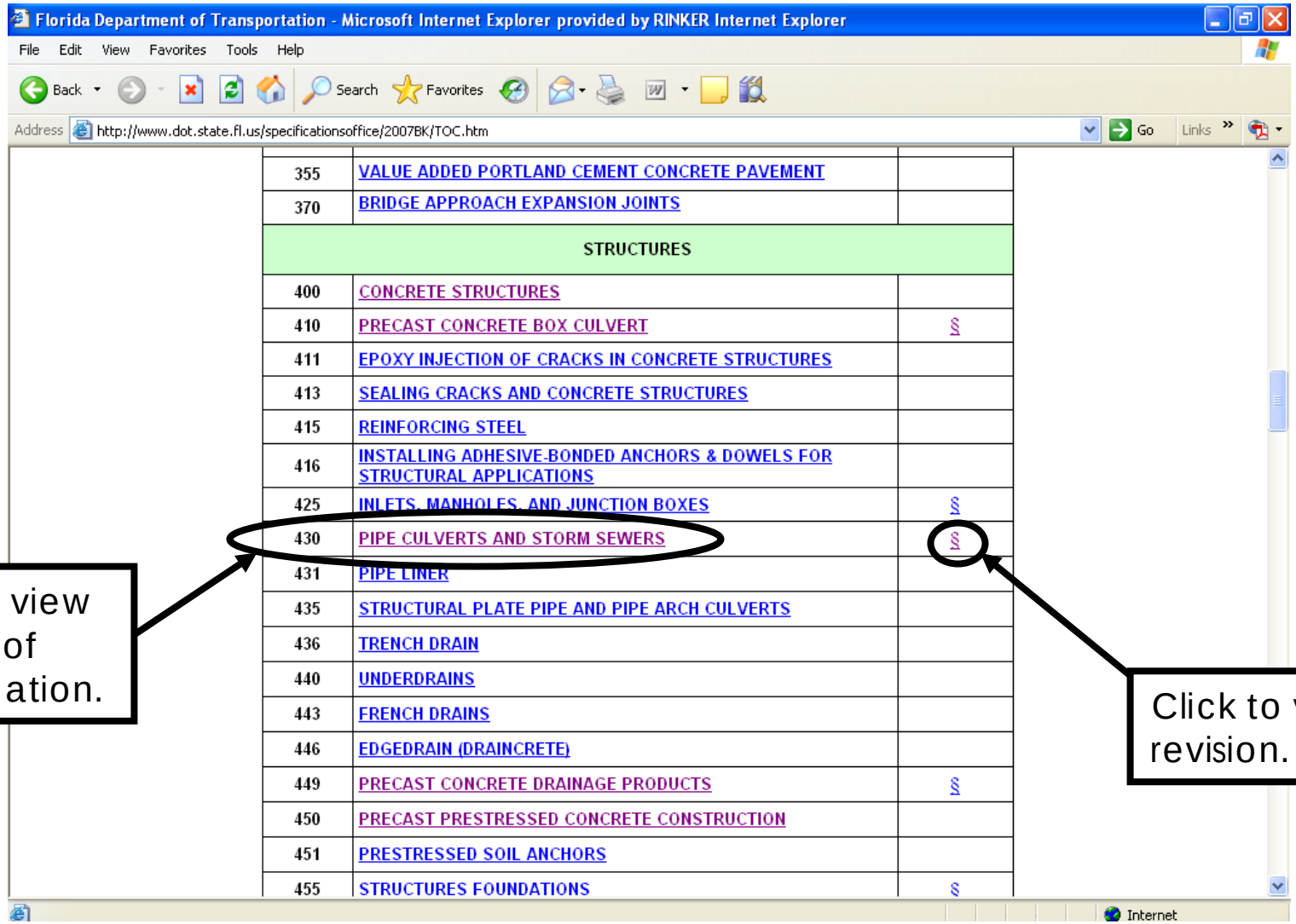
- “Special Provisions” – Specific clauses adopted by FDOT to revise Standard / Supplemental Specs, applicable to specific projects.
- “Technical Special Provisions” – Specs prepared outside the State Spec. Office, technical in nature, applicable to specific projects.
- “Developmental Specification” – Spec. that is developed based on a new process or material.

FDOT Specification Office Website

http://www.dot.state.fl.us/specificationsoffice/



FDOT Specifications Office Website (Continued)



Click to view full text of specification.

Click to view revision.

Specifications Often Change

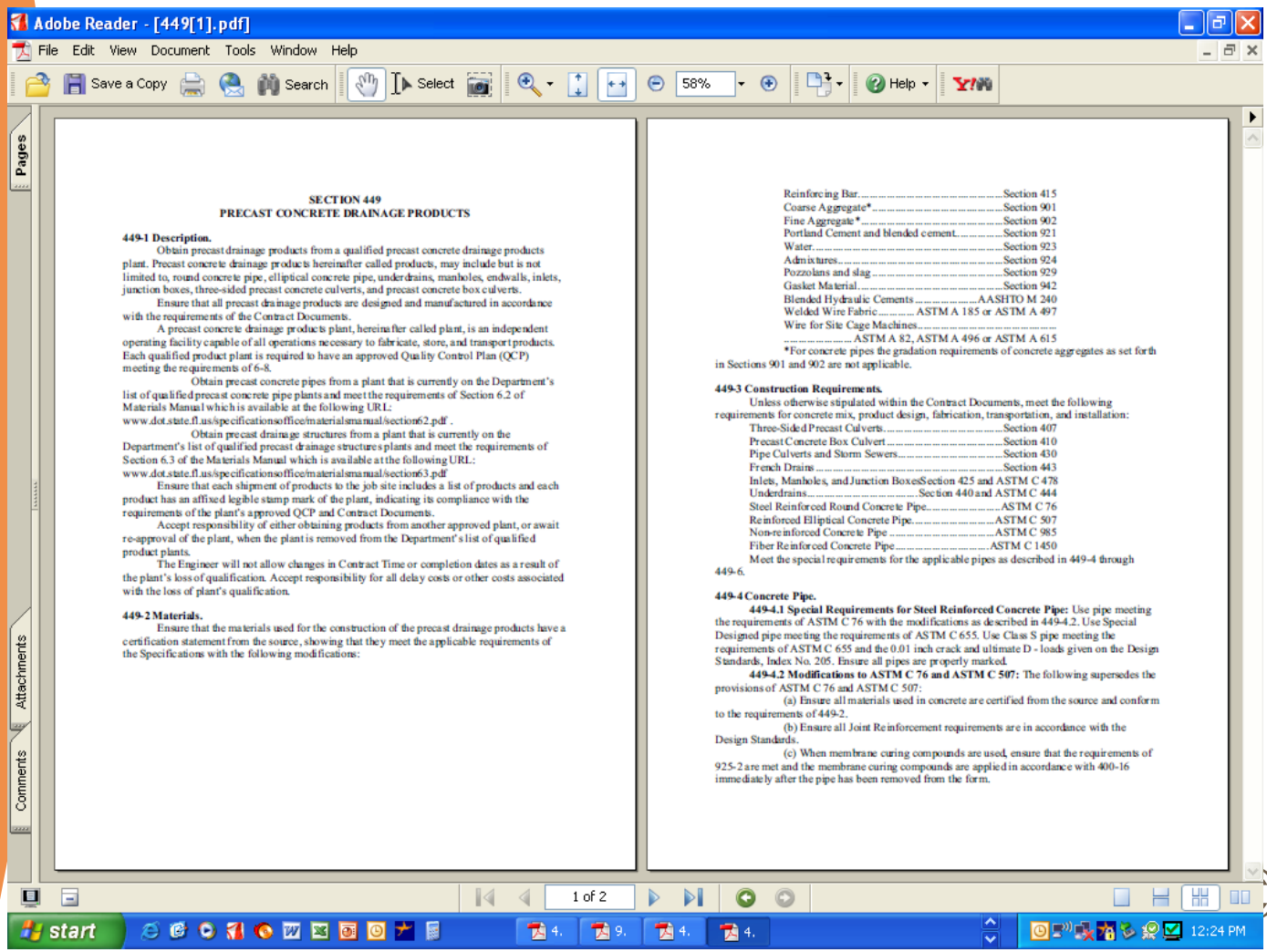
- Changes Published in “Workbooks”
  - Released in January and July
- Mandatory Revisions
- Proposed Spec. Modifications
  - Subscribe to FTBA News for Announcements
  - Designate Someone to Monitor Spec. Changes
  - FTBA News [news@FTBA.com]

Key RCP Specifications (FDOT)

Steel Reinforced Concrete Pipe (RCP)

- Section 430: Pipe Culverts and Storm Sewers (all pipe materials)
- Section 443: French Drains (slotted pipe)
- Section 449: Precast Concrete Drainage Products (RCP and FRCP)
- Section 942: Pipe Gaskets

Section 449



SECTION 449
PRECAST CONCRETE DRAINAGE PRODUCTS

449-1 Description.

Obtain precast drainage products from a qualified precast concrete drainage products plant. Precast concrete drainage products hereinafter called products, may include but is not limited to, round concrete pipe, elliptical concrete pipe, underdrains, manholes, endwalls, inlets, junction boxes, three-sided precast concrete culverts, and precast concrete box culverts.

Ensure that all precast drainage products are designed and manufactured in accordance with the requirements of the Contract Documents.

A precast concrete drainage products plant, hereinafter called plant, is an independent operating facility capable of all operations necessary to fabricate, store, and transport products. Each qualified product plant is required to have an approved Quality Control Plan (QCP) meeting the requirements of 6-8.

Obtain precast concrete pipes from a plant that is currently on the Department's list of qualified precast concrete pipe plants and meet the requirements of Section 6.2 of Materials Manual which is available at the following URL:
www.dot.state.fl.us/specificationsoffice/materialsmanual/section62.pdf .

Obtain precast drainage structures from a plant that is currently on the Department's list of qualified precast drainage structures plants and meet the requirements of Section 6.3 of the Materials Manual which is available at the following URL:
www.dot.state.fl.us/specificationsoffice/materialsmanual/section63.pdf

Ensure that each shipment of products to the job site includes a list of products and each product has an affixed legible stamp mark of the plant, indicating its compliance with the requirements of the plant's approved QCP and Contract Documents.

Accept responsibility of either obtaining products from another approved plant, or await re-approval of the plant, when the plant is removed from the Department's list of qualified product plants.

The Engineer will not allow changes in Contract Time or completion dates as a result of the plant's loss of qualification. Accept responsibility for all delay costs or other costs associated with the loss of plant's qualification.

449-2 Materials.

Ensure that the materials used for the construction of the precast drainage products have a certification statement from the source, showing that they meet the applicable requirements of the Specifications with the following modifications:

Reinforcing Bar	Section 415
Coarse Aggregate*	Section 901
Fine Aggregate*	Section 902
Portland Cement and blended cement	Section 921
Water	Section 923
Admixtures	Section 924
Pozzolans and slag	Section 929
Gasket Material	Section 942
Blended Hydraulic Cements	AASHTO M 240
Welded Wire Fabric	ASTM A 185 or ASTM A 497
Wire for Site Cage Machines	ASTM A 82, ASTM A 496 or ASTM A 615

*For concrete pipes the gradation requirements of concrete aggregates as set forth in Sections 901 and 902 are not applicable.

449-3 Construction Requirements.

Unless otherwise stipulated within the Contract Documents, meet the following requirements for concrete mix, product design, fabrication, transportation, and installation:

Three-Sided Precast Culverts	Section 407
Precast Concrete Box Culvert	Section 410
Pipe Culverts and Storm Sewers	Section 430
French Drains	Section 443
Inlets, Manholes, and Junction Boxes	Section 425 and ASTM C 478
Underdrains	Section 440 and ASTM C 444
Steel Reinforced Round Concrete Pipe	ASTM C 76
Reinforced Elliptical Concrete Pipe	ASTM C 507
Non-reinforced Concrete Pipe	ASTM C 985
Fiber Reinforced Concrete Pipe	ASTM C 1450

Meet the special requirements for the applicable pipes as described in 449-4 through 449-6.

449-4 Concrete Pipe.

449-4.1 Special Requirements for Steel Reinforced Concrete Pipe: Use pipe meeting the requirements of ASTM C 76 with the modifications as described in 449-4.2. Use Special Designed pipe meeting the requirements of ASTM C 655. Use Class S pipe meeting the requirements of ASTM C 655 and the 0.01 inch crack and ultimate D - loads given on the Design Standards, Index No. 205. Ensure all pipes are properly marked.

449-4.2 Modifications to ASTM C 76 and ASTM C 507: The following supersedes the provisions of ASTM C 76 and ASTM C 507:

(a) Ensure all materials used in concrete are certified from the source and conform to the requirements of 449-2.

(b) Ensure all Joint Reinforcement requirements are in accordance with the Design Standards.

(c) When membrane curing compounds are used, ensure that the requirements of 925-2 are met and the membrane curing compounds are applied in accordance with 400-16 immediately after the pipe has been removed from the form.

Key RCP Materials Specs (FDOT)

- Section 901: Coarse Aggregate
- Section 902: Fine Aggregate
- Section 921: Portland Cement and Blended Cement
- Section 923: Water
- Section 924: Admixtures
- Section 929: Pozzolans and Slag
- Section 942: Gasket Material
- Section 415: Reinforcing Bar

Other Key RCP Specifications: ASTM and AASHTO

Cementitious

- AASHTO M85: Portland Cement
- ASTM C 618: Fly Ash

Steel Reinforcement

- ASTM A185 and A497: Welded Wire Reinforcement
- ASTM A82, A496, or A615: Wire for Site Cage Machines

RCP Design, Fabrication, Performance

- ASTM C76 (round pipe)
- ASTM C507 (elliptical pipe)

Key RCB Specifications (FDOT)

- Precast Reinforced Concrete Box Culverts (RCB)
  - Section 410: Precast Concrete Box Culvert
  - Section 407: Three-sided Precast Culverts
- Concrete
  - Section 346: Portland Cement Concrete
- Reinforcing Steel
  - Section 415: Reinforcing Steel

Key Precast RCB Specifications: and AASHTO

- Precast RCB Design and Fabrication
  - ASTM C1433 / C1577 (not referenced by FDOT)
- Joints
  - ASTM C990
- Reinforcing Steel
  - ASTM A82, A496, or A615: Wire for Site Cage Machines
  - ASTM A185, A497: Welded Wire Reinforcement
- Similar ASTM / AASHTO Specifications As Required For Concrete Pipe

FDOT State Materials Office

Web Site

http://www.dot.state.fl.us/statematerialsoffice/

Material Producer List

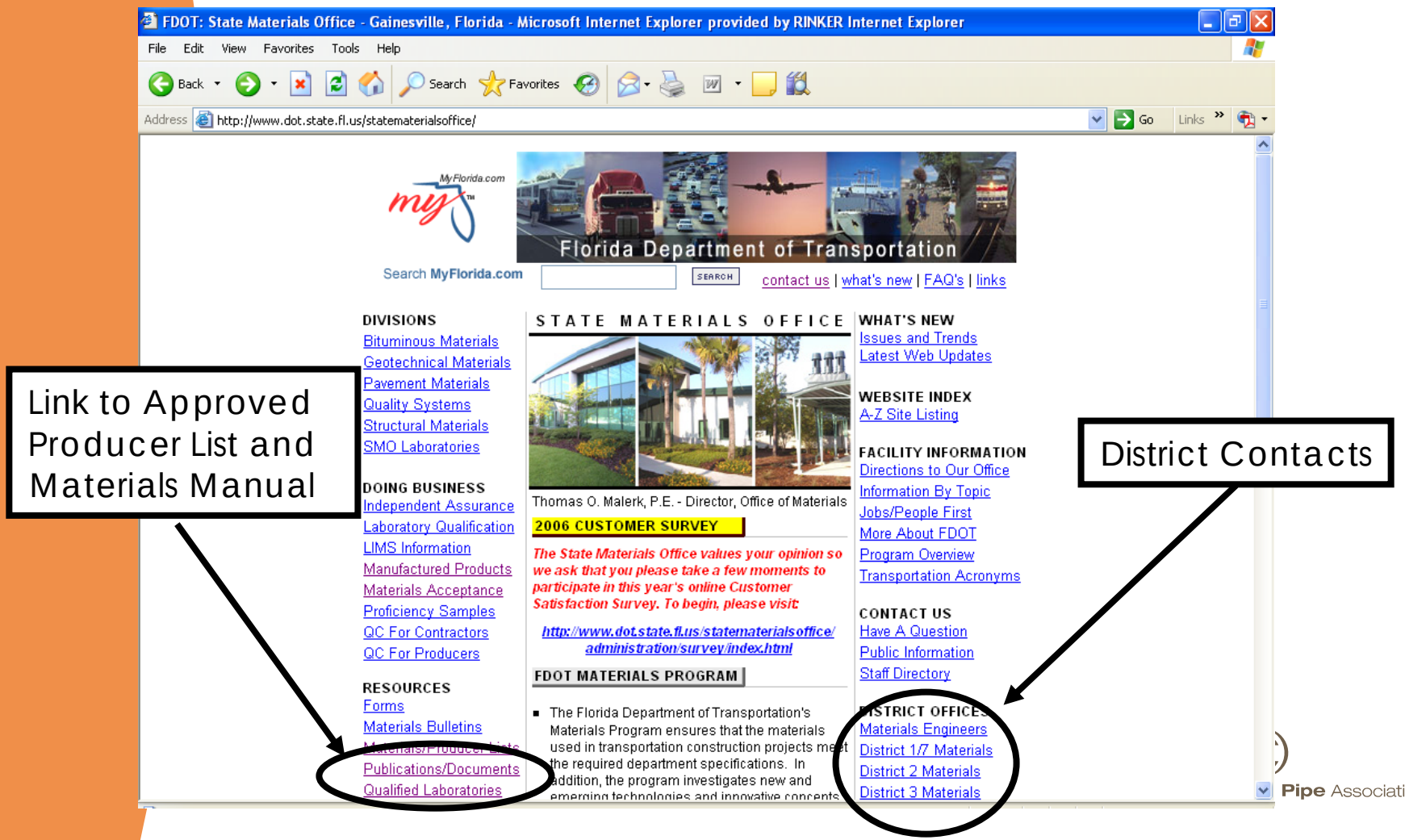
http://www.dot.state.fl.us/statematerialsoffice/quality/programs/qualitycontrol/materialslistings/postjuly2002.htm

Materials Manual

http://www.dot.state.fl.us/statematerialsoffice/administration/resources/library/publications/materialsmanual/index.htm

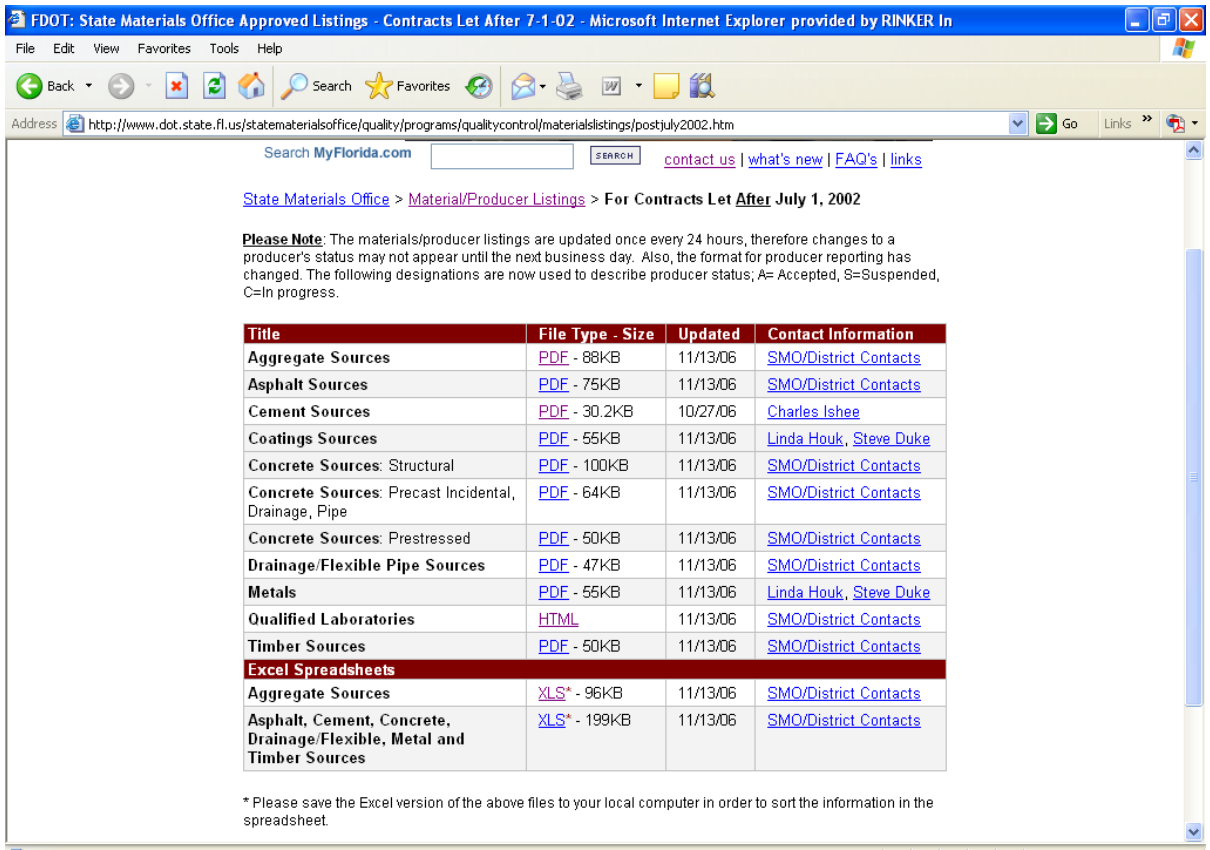
FDOT State Materials Office Website

http://www.dot.state.fl.us/statematerialsoffice/



Qualified Producer Lists

http://www.dot.state.fl.us/statematerialsoffice/quality/programs/qualitycontrol/materialslistings/postjuly2002.htm



FDOT: State Materials Office Approved Listings - Contracts Let After 7-1-02 - Microsoft Internet Explorer provided by RINKER In

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Address http://www.dot.state.fl.us/statematerialsoffice/quality/programs/qualitycontrol/materialslistings/postjuly2002.htm Go Links

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State Materials Office > Material/Producer Listings > **For Contracts Let After July 1, 2002**

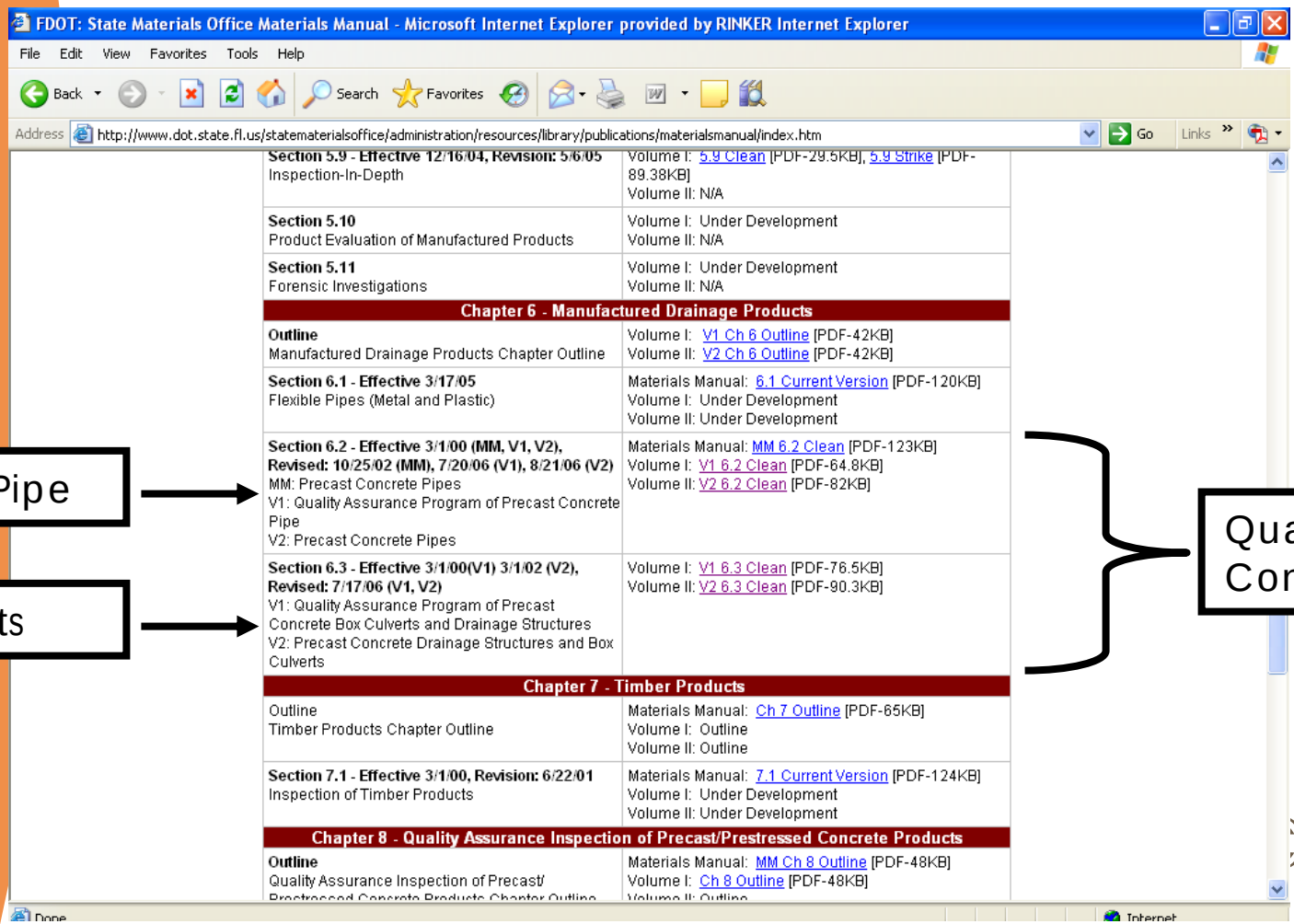
Please Note: The materials/producer listings are updated once every 24 hours, therefore changes to a producer's status may not appear until the next business day. Also, the format for producer reporting has changed. The following designations are now used to describe producer status; A= Accepted, S=Suspended, C=In progress.

Title	File Type - Size	Updated	Contact Information
Aggregate Sources	PDF - 88KB	11/13/06	SMO/District Contacts
Asphalt Sources	PDF - 75KB	11/13/06	SMO/District Contacts
Cement Sources	PDF - 30.2KB	10/27/06	Charles Ishee
Coatings Sources	PDF - 55KB	11/13/06	Linda Houk, Steve Duke
Concrete Sources: Structural	PDF - 100KB	11/13/06	SMO/District Contacts
Concrete Sources: Precast Incidental, Drainage, Pipe	PDF - 64KB	11/13/06	SMO/District Contacts
Concrete Sources: Prestressed	PDF - 50KB	11/13/06	SMO/District Contacts
Drainage/Flexible Pipe Sources	PDF - 47KB	11/13/06	SMO/District Contacts
Metals	PDF - 55KB	11/13/06	Linda Houk, Steve Duke
Qualified Laboratories	HTML	11/13/06	SMO/District Contacts
Timber Sources	PDF - 50KB	11/13/06	SMO/District Contacts
Excel Spreadsheets			
Aggregate Sources	XLS* - 96KB	11/13/06	SMO/District Contacts
Asphalt, Cement, Concrete, Drainage/Flexible, Metal and Timber Sources	XLS* - 199KB	11/13/06	SMO/District Contacts

* Please save the Excel version of the above files to your local computer in order to sort the information in the spreadsheet.

State Materials Manual

http://www.dot.state.fl.us/statematerialsoffice/administration/resources/library/publications/materialsmanual/index.htm



Concrete Pipe

Box Culverts

Quality Control

Pipe Association

VOLUME I

SECTION 6.2

QUALITY ASSURANCE PROGRAM OF PRECAST CONCRETE PIPE

6.2.1 PURPOSE

This procedure provides guidance to the Florida Department of Transportation personnel related to the development and implementation of the quality control and quality assurance programs for the manufacture, storage, and transportation of the precast concrete pipe for the Florida Department of Transportation projects.

Roles and Responsibilities

6.2.5 GENERAL INFORMATION

The Precast Concrete Pipe Plants (Plants) produce, inspect, store, and ship Precast Concrete Pipe (Pipe) meeting the requirements of the Specifications and other Contract Documents. The District Materials Offices verify that manufactured Pipe conforms to the requirements of the Contract Documents. The District Materials Office accepts (approves) their quality control plans and inspects the plants prior to commencement of any work.

Section 6.2
Plant Qualification Review Process

- Plant submits proposed QC Plan
- District Materials Office Review
  - Manufacturing
  - Quality Control Testing
  - Inspections and Documentation
  - Forming, Steel Placement
  - Storage and Shipping
- Approval – “A” on Qualified Producer List

Maintaining Quality Control Plan and Plant Qualification Status

Annual plant qualification reviews

- Test data representing all pipe diameters
- Submit any changes to QC Plan

Materials Manual, Section 5.6

- Quality Control Program

Volume II

Section 6.2

PRECAST CONCRETE PIPE

6.2.1 PURPOSE

This procedure provides guidance for the development and implementation of the quality control program for the manufacture, storage, and transportation of the precast concrete pipe (Pipe) for the Florida Department of Transportation projects. The Pipe may include, but are not limited to, round concrete pipe, elliptical concrete pipe, mitered end sections, and underdrain pipe.

VOLUME I

Section 6.3

QUALITY ASSURANCE PROGRAM OF PRECAST CONCRETE BOX CULVERTS AND DRAINAGE STRUCTURES

6.3.1 PURPOSE

This procedure provides guidance to Department personnel related to the implementation of the quality control and quality assurance programs for precast concrete box culverts and drainage structures (Structures).

VOLUME II

Section 6.3

PRECAST CONCRETE DRAINAGE STRUCTURES AND BOX CULVERTS

6.3.1 PURPOSE

This procedure provides guidance for the development and implementation of the quality control for the manufacture, storage, and transportation of the precast concrete drainage structures and box culverts (Structures) for the Florida Department of Transportation projects. The Structures may include, but are not limited to, inlets, manholes, junction boxes, endwalls, three-sided precast concrete culverts, and precast concrete box culverts.

The Department will perform periodic quality assurance inspections, sampling, and testing to ensure of the quality and acceptability of the materials, methods, techniques, procedures and processes being utilized by the manufacturer in the fabrication of precast concrete products. The quality assurance inspection and testing will be performed in accordance with ***Section 6.3. Volume I.*** of the ***Materials Manual***.

FDOT Roadway Design Office

Web Site

http://www.dot.state.fl.us/rddesign/default.htm

State Drainage Office

Oversees all Pipe Issues

Excluding Box Culverts (Structures)

Florida Department of Transportation - Microsoft Internet Explorer provided by RINKER Internet Explorer

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Address http://www.dot.state.fl.us/rddesign/default.htm Go Links

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Welcome to the State Roadway Design Office

David O'Hagan, P.E., State Roadway Design Engineer

Email: David.OHagan@dot.state.fl.us

Our Mission	Our Vision	Our Values
To Develop and provide policy, procedures, criteria and standards for design of Florida Roadways; monitor their implementation; and provide training.	Provide excellence in the products, services, and information we deliver to our customers.	Teamwork Respect Accountability Integrity Leadership Service

Design Standard Index

Roadway Topics

- FDOT Homepage
- Design Build
- Design Standards
- District Design Newsletters
- Drainage

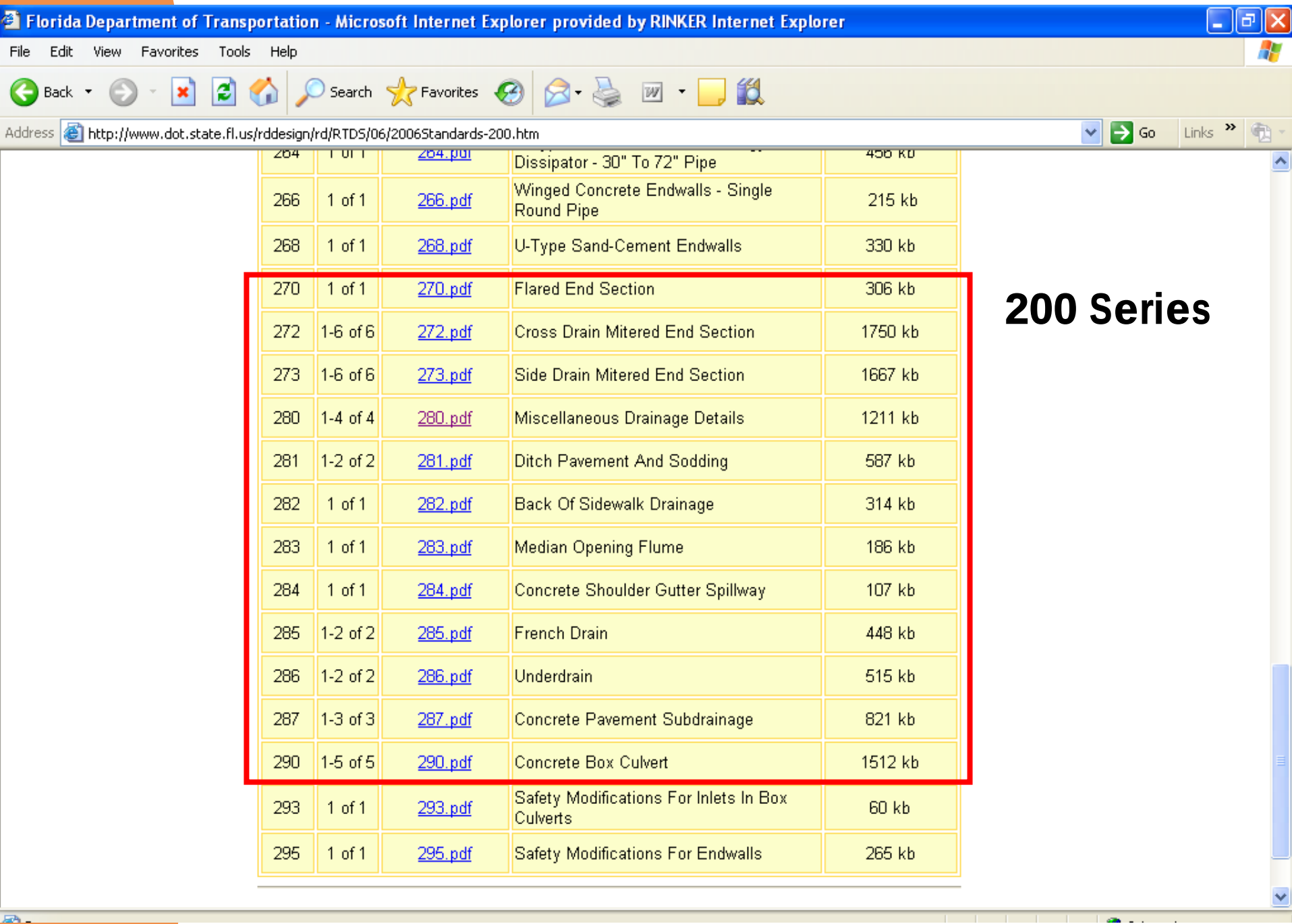
The Office of Roadway Design is an integral part of the Florida Department of Transportation. Our office is located at **605 Suwannee Street Mail Station 32 Tallahassee, Florida 32399-0450.**

If you should have any questions, comments or suggestions regarding our web site or the Office of Roadway Design, you can contact us via e-mail link or call us at (850)414-4310.

There is a new number that can be used for faxes sent by E-mail. The number is **(850) 412-8044.**

The new fax numbers for the office fax machine are (850) 414-5261

http://www.dot.state.fl.us/ Internet



264	1 of 1	264.pdf	Dissipator - 30" To 72" Pipe	456 kb
266	1 of 1	266.pdf	Winged Concrete Endwalls - Single Round Pipe	215 kb
268	1 of 1	268.pdf	U-Type Sand-Cement Endwalls	330 kb
270	1 of 1	270.pdf	Flared End Section	306 kb
272	1-6 of 6	272.pdf	Cross Drain Mitered End Section	1750 kb
273	1-6 of 6	273.pdf	Side Drain Mitered End Section	1667 kb
280	1-4 of 4	280.pdf	Miscellaneous Drainage Details	1211 kb
281	1-2 of 2	281.pdf	Ditch Pavement And Sodding	587 kb
282	1 of 1	282.pdf	Back Of Sidewalk Drainage	314 kb
283	1 of 1	283.pdf	Median Opening Flume	186 kb
284	1 of 1	284.pdf	Concrete Shoulder Gutter Spillway	107 kb
285	1-2 of 2	285.pdf	French Drain	448 kb
286	1-2 of 2	286.pdf	Underdrain	515 kb
287	1-3 of 3	287.pdf	Concrete Pavement Subdrainage	821 kb
290	1-5 of 5	290.pdf	Concrete Box Culvert	1512 kb
293	1 of 1	293.pdf	Safety Modifications For Inlets In Box Culverts	60 kb
295	1 of 1	295.pdf	Safety Modifications For Endwalls	265 kb

200 Series

Key RCP Standard Indices

Index 299 – Geotextile Material

D-3 Filter Fabric Standard Criteria

Index 205 – Cover Height

Pipe Class and D-Loads

Index 270 – Flared Ends

Indices 272 / 273 – Mitered Ends

Key RCP Standard Indices

Index 280 – Misc. Details

- Joint Designs
- RCP – CMP Jackets
- Integral Manhole Risers

Index 285 – French Drains

- Slotting Schedule

Precast Box Culvert
Key Standard Indices

Index 290 – Box Culvert Details

Index 291 – Supplemental Details

- Joint Details
- Connections to CIP Headwalls

Index 292 – Standard Steel Designs

- Release January 2007
- Steel tables similar to ASTM Standards

FDOT Structures Design Office

Web Site

http://www.dot.state.fl.us/structures/default.htm

Oversees precast box culvert issues

Does not oversee pipe issues

Structures Manual

http://www.dot.state.fl.us/structures/StructuresManual/CurrentRelease/FDOTBridgeManual.htm

Concrete and Environment

FDOT requires thicker concrete cover over the steel in precast RCB.

ASTM C1433 requires 1 inch cover.

FDOT requires 2 inches cover minimum and

Requires 3 inches in "Extremely Aggressive" environments.

Ref. Table 1.2 (Concrete Cover), Structures Manual.

American **Concrete Pipe** Association

RCB concrete mix design properties are based on FDOT Section 346 and the Environmental Classification.

Refer to Table 1.3 (Structural Concrete Class Requirements), Structures Manual.

In "Moderately Aggressive" environments, Class IV concrete is to be used at a minimum.

1.4 Concrete and Environment [5.12.1]

1.4.1 Cover

Delete AASHTO *LRFD 5.12.3* and substitute the following requirements:

A. The requirements for concrete cover over reinforcing steel are listed in Table 1.2. Examples of concrete cover are shown in Figures 1.2 through 1.5.

B. When deformed reinforcing bars are in contact with other embedded items such as post-tensioning ducts, the actual bar diameter, including deformations, must be taken into account in determining the design dimensions of concrete members and in applying the design covers of Table 1.2.

Table 1.2 Concrete Cover

	CONCRETE COVER (inches)	
	S or M*	E*
Superstructure (Precast)		
Internal and external surfaces (except riding surfaces) of segmental concrete boxes, and external surfaces of prestressed beams (except the top surface):	2	
Top surface of girder top flange:	1	
Top deck surfaces: Short Bridges***	2	
Top deck surfaces: Long Bridges***:	2 1/2**	
All components and surfaces not included above (including barriers):	2	
Superstructure (Cast-in-Place)		
All external and internal surfaces (ex. top surfaces):	2	
Top deck surfaces; Short Bridges [3]:	2	
Top deck surfaces; Long Bridges [3]:	2 1/2*	
Substructure (Precast and Cast-in-Place)		
External surfaces cast against earth and surfaces in contact with water:	4	4 1/2
Ext. formed surfaces, columns, and tops of footings not in contact w/ water:	3	4
Internal surfaces:	3	
Top of Girder Pedestals:	2	
Substructure (Precast):	3	4
Prestressed Piling (including cylinder piling):	3	
Drilled Shaft and auger cast piles:	6	
Retaining Walls (Cast-in-Place or Precast)(Excluding MSE walls[4]) :	2	3
Culverts (Cast-in-Place or Precast):	2	3
Bulkheads:	4	

*S = Slightly Aggressive; M = Moderately aggressive; E = Extremely Aggressive.
**Cover dimension includes a 0.5-inch allowance for milling.
3- See Short & Long Bridge Definitions in Chapter 4.
4- See SDG 3.13 for MSE wall cover requirements.

Structures Design Guidelines, Florida Department of Transportation, Structures Design Office, July 2006.

Table 1.3 Structural Concrete Class Requirements

CONCRETE LOCATION AND USAGE		ENVIRONMENTAL CLASSIFICATION		
		Slightly Aggressive	Moderately Aggressive	Extremely Aggressive
SUPERSTRUCTURE	Cast-in-Place (other than Bridge Decks)	Class II	Class IV	
	Cast-in-Place Bridge Deck (Including Diaphragms)	Class II (Bridge Deck)	Class IV	
	Approach Slabs	Class II (Bridge Deck)		
	Precast or Prestressed	Class III, IV, V, or VI	Class IV, V, or VI	
SUBSTRUCTURE	Cast-in-Place (other than Bridge Seals)	Class II	Class IV	Class IV, or V
	Precast or Prestressed (other than piling)	Class III, IV, V, or VI	Class IV, V, or VI	
	Cast-in-Place Columns located directly in splash zone	Class II	Class IV	
	Piling	Class V (Spec.) or VI		
	Drilled Shafts	Class IV (Drilled Shafts)		
	Retaining Walls	Class II or III	Class IV	

Corrosion Protection Measures: Calcium nitrite and/or silica fume admixtures may be required. Admixture use must conform to the requirements of "Concrete Class and Admixtures for Corrosion Protection."

Structures Design Guidelines, Florida Department of Transportation, Structures Design Office, July 2006.

Environment and Cement Type

346-2.2 Types of Cement: Unless a specific type of cement is designated elsewhere, use Type I, Type IP, Type IS, Type IP (MS), Type II, or Type III cement in all classes of concrete.
Use only the types of cements designated for each environmental condition in structural concrete. A mix design for a more aggressive environment may be substituted for a lower aggressive environmental condition.

Table 1

BRIDGE SUBSTRUCTURE, DRAINAGE STRUCTURES AND OTHER STRUCTURES			
Component	Slightly Aggressive Environment	Moderately Aggressive Environment	Extremely Aggressive Environment
All Elements	Type I or Type III	Type I with Fly Ash and/or Slag, Type II, Type IP, Type IP (MS), or Type IS	Type II with Fly Ash or Slag

Portland Cement
FDOT Requires AASHTO M85

ASTM C150 permits up to 5% limestone addition, a 1% process addition, and has no cap on C3S.

AASHTO M85 allows only a 1% process addition and has a maximum C3S cap of 58%.

At this time, ASTM C150 and AASHTO M85 cement have different properties.

AASHTO and ASTM are coordinating to harmonize the specifications.

Environment and Cement Type

All AASHTO M85 Type II meets M85 Type I.

If your mill cert states “M85 Type I/II” that would imply that it meets M85 Type II and would therefore be acceptable for FDOT Class IV extremely aggressive concrete.

If your mill cert states only “ASTM C150 I/II” it likely will not meet AASHTO II.

Not all Class IV concrete requires AASHTO M85 Type II cement - only those in an extremely aggressive environment.

M85 Type I may be used in moderately aggressive environments.

Environment Classification

Effects Precast Box Culvert Designs

- Concrete Cover Thickness
- Concrete Type and Mix Properties
- Cement Type

Summary

- Know How to Find Specs and Standards
- FDOT Web Site
- Read the Specs
- Understand the Specs
- Do not assume specs are the same for all projects – check contract documents