Structures Design Manual 2013 Updates

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2013 Structures Manual

- Modifications to the Structures Manual for 2013
  - ✓ Guide to FDOT Publications
  - ✓ Modifying the Structures Manual
  - ✓ Modifications to VOL 1 of the Structures Manual
    - **STRUCTURES DESIGN GUIDELINES**
  - ✓ Modifications to VOL 2 of the Structures Manual
    - **STRUCTURES DETAILING MANUAL**
  - ✓ 2013 Design Bulletins

Guide to FDOT Publications

Speaking to the Designer:

- ☑ Structures Manual
- ❑ Plans Preparations Manual
- ❑ Basis of Estimates
- ❑ Instructions for Design Standards
- ❑ Design Bulletins
- ❑ Other design manuals such as Traffic Engineering, Drainage, Pavement, Soils and Foundations, etc.

Speaking to the Contractor/Manufacturer's:

Designers must be familiar with each of this components, but direction to, or information for designers are not (should not be) included in these documents.

- ❑ Design Standards
- ❑ Specifications
- ❑ Materials Manual
- ❑ Qualified Products

Speaking to the CEI:

- ❑Construction Project Administration Manual (CPAM)
- ❑Construction Memos

Guide to FDOT Publications

Structures Manual Volume 1 - SDG:

- Structures Design Guidelines: Includes additions, deletions, or modifications to the requirements of the AASHTO LRFD Bridge Design Specifications (LRFD).

Structures Manual Volume 2 - SDM:

- Structures Detailing Manual: Provides **guidance** for drafting and detailing criteria and methods used in preparing Florida Department of Transportation (FDOT) contract plans for structural elements or systems. It also includes **preferred** details and examples of general components and plan sheets.

True or False?

- The Structures Manual is a construction contract document and must be followed to ensure proper construction in accordance with FDOT standards.

Guide to FDOT Publications

Structures Manual Volume 1 - SDG:

- Structures Design Guidelines: Includes additions, deletions, or modifications to the requirements of the AASHTO LRFD Bridge Design Specifications (LRFD).

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True or False?

- The Structures Manual is a construction contract document and must be followed to ensure proper construction in accordance with FDOT standards.

FALSE

- The Structures Manual is a **DESIGN** contract document and must be followed to ensure proper design in accordance with FDOT standards.

FDOT Manual Audiences

- The FDOT Manuals are authored to particular audiences that are performing work on the State Transportation System. Below is a list of intended audiences by Manual that the Department is addressing with the State Specific Manuals:
  - ✓ Structures Design Guidelines / Structures Detailing Manual / Soils and Foundation Handbook:
    - Designers of Structural Elements on State Transportation Projects (**EOR for Conventional Projects, EOR for Design-Build & 3P Projects** & Authors for Design-Build Request for Proposals (RFP) prior to solicitation).
    - The Structures Design Guidelines include a New Chapter (Chapter 11) that is specific to Contractor's Specialty Engineers.
  - ✓ State Design Standards & Instructions to Design Standards
    - Designers and Contractors of State Transportation Projects.
  - ✓ Plans Preparation Manual
    - Designers of State Transportation Projects.

Modifying the Structures Manual

- Revisions to the Structures Manual may be the result of changes in FDOT specifications, FDOT organization, Federal Highway Administration (FHWA) regulations, and AASHTO requirements; or occur from recent experience gained during construction, through maintenance, and research.
- Structures Manual users are encouraged to suggest modifications and improvements such as design procedures, text clarity, technical data, or commentary. Address questions regarding this Manual and any proposed modifications to the Structures Design Office.

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Modifications To The 2013 Structures Design Manual

Daniel L. Scheer, P.E.

Structures Manual:

- **INTRODUCTION**
  - ✓ **I.1.** **Added language for Non-Conventional projects.**
  - ✓ **I.2.** **Updated title of Volume 9 to LTS-6.**
  - ✓ **I.6 .** **Updated Paragraph B.5 per SDB 12-04. Updated Paragraph B.7 to LTS-6 (2012). Updated Paragraph C.4 name. Updated Paragraph D.1 to Fourteenth Edition.**
  - ✓ **I.7.** **Revised Paragraphs A and B and added Paragraph C.**
  - ✓ **I.10.** **Renamed Section and added clarification to first Paragraph.**

Structures Manual Introduction

- **I.1 GENERAL (Rev. 01/13)**

  This Manual, (FDOT Procedure # 625-020-018) provides engineering and detailing standards, criteria, and guidelines to designers and detailers who design structures for the Florida Department of Transportation.

  The requirements given in the ***Structures Manual*** apply to all projects. Special requirements for Non-Conventional Projects, e.g. Design-Build Projects and Public-Private-Partnership Projects, may be shown in a "Modification for Non-Conventional Projects" box as seen in the following example:

Modification for Non-Conventional Projects:
Delete ***SDG*** 4.2.2.C and insert the following:
C. For "Major Widenings," (see criteria in SDG Chapter 7) the thickness of CIP bridge decks on beams or girders is 8-inches unless otherwise indicated in RFP.

  These boxes are located immediately before or after the section which is to be modified. The requirements listed within these boxes are only applicable to Non-Conventional Projects.

Structures Manual Introduction

- **I.1 GENERAL (Rev. 01/13) - Cont'd**

  *Commentary: The goal of this format is to better clarify the requirements for Non-Conventional Projects. This Manual as well as companion documents are intended to addresses **five distinct audiences** listed below:*

  1. The Engineer of Record on a Design-Build Project. The Structures Manual requirements apply except where specifically modified by a Non-Conventional Modification Box.

  2. The Engineer of Record on a Conventional Design-Bid-Build Project. The Structures Manual requirements apply.

Structures Manual Introduction

- **I.1 GENERAL (Rev. 01/13) - Cont'd**

3. The Author of the Request for Proposal on a Design Build Project. Standard boilerplate language is to be used as a starting point in developing RFPs on all Department Design-Build projects. Section V of the Design-Build boilerplate establishes Department, FHWA, AASHTO manuals, guidelines, and design codes that serve as design constraints to be used in the performance of the work. The governing regulations list in Section V cannot be modified without the approval of the State Construction Office. The standard boilerplate language is available at the FDOT Construction Office website. Pre-scoping questions have been developed to aid in establishing project constraints to be included in the RFP. See link below:
http://www.dot.state.fl.us/construction/DesignBuild/DBRules/DB-PreBid-Scoping-Questions.pdf

FDOT Explanation:

The link above shown in the Introduction to the Structures Manual is to the RFP development pre-scoping questions.

There is a Design-Build Boiler plate (shown on the next slide) that also shows the link to the pre-scoping questions.

Structures Manual Introduction

- **Design Build Boiler Plate Document**

Note to developer of the RFP: *An electronic copy of the RFP, with changes clearly identified, shall be submitted to the State Construction Office for review and approval prior to submittal to Design-Build Firms. All RFP's which govern Projects where Category 1 structures are anticipated shall be reviewed and approved by the District Structures Engineer. All RFP's which govern Projects where Category 2 structures are anticipated shall be reviewed and approved by the State Structures Engineer. All Design-Build Finance RFP's shall be reviewed and approved by the Comptroller's Office. In addition, any major revisions to the RFP, innovative concepts used or RFP's for unique Projects shall be reviewed by Central Office Legal. The Office of General Counsel's Design-Build Legal Team shall review RFP's for all Projects which involve utility relocation. RFP requirements which have been modified in this document since the publishing of version 2011-03a (dated 12/16/2011) are highlighted herein.*

To aid in the development of Project specific RFP requirements a series of pre-scoping questions has been developed. The pre-scoping questions cover many common issues that frequently arise on FDOT Projects and can be down loaded from the following website: http://www.dot.state.fl.us/construction/DesignBuild/DBRules/DBRulesMain.shtm

NOTE: When submitting a RFP for review, edits to this boilerplate document shall be clearly identifiable. Deletions shall be stricken through (delete) and inserted language shall be underlined in color (underline). Submitted RFPs with the changes made as indicated above will help shorten the review time for everyone involved.

Florida Department of Transportation
District X

DESIGN-BUILD
REQUEST FOR PROPOSAL
for
<Project Description, County>

Financial Projects Number(s):
Federal Aid Project Number(s):
Contract Number:

Structures Manual Introduction

- **NEW format for the Pre-Scoping Questions, posted January-2013**

Document Reference	Pre-scoping Question	FDOT Contact
PD&E Manual Part 1, Chapter 12 (old Chapter 10) PD&E Manual Part 2, Chapter 11 PD&E Manual Part 2, Chapter 18, Environmental Document, Wetland Evaluation Report, Biological Assessment, Essential Fish Habitat Assessment	Seagrass Avoidance and Minimization: Are there sea grasses within or in the vicinity of the project limits (for water projects)? Are there turbidity/jetting restrictions? Are temporary work platforms required to facilitate crane access in shallow water? Have the permits been acquired? Will they be acquired prior to or during the Design build phase? Is the project federally funded? What are the specific permit requirements to be conveyed in the RFP?	District Environmental Engineer, Environmental Administrator, Environmental Permits Coordinator
PD&E Manual Part 2, Chapter 18, PD&E Manual Part 1 Chapter 12 (old Chapter 10) PD&E Manual Part 2, Chapter 27 Environmental Document, Wetland Evaluation Report, Biological Assessment, Essential Fish Habitat Assessment	Wetland Avoidance and Minimization: Are there jurisdictional wetlands within the project limits? Are there areas within the R/W limits that the Contractor can not disturb? How will impacts be minimized? Have the permits been acquired? Will they be acquired prior to or during the Design build phase? Is the project federally funded? What are the specific permit requirements to be conveyed in RFP?	District Environmental Engineer, Environmental Administrator, Environmental Permits Coordinator
PD&E Manual Part 2, Chapter 22 Environmental Document, Contamination Screening Evaluation Report	Contamination Impacts: Are there contaminated sites or contaminated materials within the project limits? Will location and type of contamination dictate roadway alignments, retention pond placement, or structure versus retaining walls? Address items such as special handling and disposal requirements of drilled shaft or other excavated materials. Clearly indicate the presence of lead based paint, asbestos, creosote or other hazardous materials and include requirements in the RFP.	District Environmental Engineer, District Contamination Impact Coordinators
PPM Vol. 1, Chapter 27	Bridge Permit – USCG: For bridges crossing navigable waterways, has the minimum vertical	District Environmental

Structures Manual Introduction

- **I.1 GENERAL (Rev. 01/13) - Cont'd**

  4. Contractor's Engineer of Record or Specialty Engineer on a Design-Build or Design-Bid-Build Project. Structures Manual, Structures Design Guidelines, Chapter 11 apply.

  5. Consultant Performing Professional Services during the PD&E Phase of a Design-Build or Design-Bid-Build Project. The Structures Manual requirements apply.

  Refer to the Design-Bid-Build and Design-Build FDOT Standard Specifications for Road and Bridge Construction, Section 1 for Definitions.

FDOT Explanation:

The format of this Structures Manual Rewrite includes a modification box immediately after the text to be modified. Typically, the black text with the white background is intended to apply to all projects except where modified by the blue modification box. The definition for "Non-Conventional Projects" includes both design-build and 3P jobs.

The implementation of the modification box is ONLY to relieve the Designer of the 'REQUIREMENT' to perform/execute that design feature/requirement as part of the project documents or to place that requirement in the RFP document.

Structures Manual Introduction

FDOT Explanation – Cont'd:

It is recognized that there may in fact be cost efficiencies when utilizing the design details/requirements outlined in the Structures Manual that are otherwise modified for non-conventional projects. Designers are still permitted to implement exempted details that are in the Manuals; but are relieved of the expectation that they utilize those details/requirements in their final design documents unless required by the RFP.

If the end of the modified text states: "….unless otherwise indicated in RFP." this denotes that a prescoping question has been added. It is general practice that where a modification box is included, a 'prescoping' question has been added for the RFP author to consider.

Types of design criteria has been exempted out of design-build and 3P projects.

- **Design Requirements based on assumed material properties or the availability of materials, assumed equipment capabilities and Department directed fabrication/construction processes or practices.**
- **Pay Item or Bidability Requirements**
- **Language requiring the EOR to contact FDOT for guidance during design based on project specific situations, these situations would have a prescoping question.**

The Department's Goal is to allow for Innovation and Cost Efficient Designs that may be developed by a Design-Build Company when not unnecessarily restrained by the Structures Manual. PPM and other Design Manuals will incorporate similar exemptions in future editions.

Structures Manual Introduction

- **I.7 COORDINATION (Rev. 01/13) – Cont'd**

B. Direct all questions concerning the applicability or requirements of any of these or other referenced documents to the appropriate FDOT Structures Design Engineer. For a list of Structures Contacts, see the contacts section of the SDO website.

Modification for Non-Conventional Projects:
Delete ***SM*** I.7.B and insert the following:
B. Prior to Procurement or After Award: Direct all questions concerning the applicability or requirements of any of these or other referenced documents to the appropriate FDOT Project Manager or to the appropriate FDOT Structures Design Engineer. For a list of Structures Contacts, see the contacts section of the SDO website. During Procurement: Direct all questions after the pre-bid meeting as instructed.

FDOT Explanation:

During Procurement – all questions pertaining to the project must be submitted and answered via the Pre-Bid meetings and Formal Question Periods to ensure that all interested parties have equal access to Department Responses for particular clarification requests/responses. The Structures Design Office will not respond to inquires during the Procurement Phase unless directly requested by the District Project Manager or District Structures Engineer.

Structures Manual Introduction

- **I.7 COORDINATION (Rev. 01/13) – Cont'd**

C. Collaborate with the roadway engineer prior to completion of Phase II roadway plans or the BDR, whichever is earlier, to assure an efficient and economical design. In particular provide structural input that will impact roadway geometrics (PPM, Volume 1, Chapter 2) and the traffic control plan (PPM, Volume 1, Chapter 10).

Modification for Non-Conventional Projects:
Delete ***SM*** I.7.C and insert the following:
C. Collaborate with the roadway engineer to assure coordination between roadway and structure design elements and the traffic control aspects during construction. Ensure that the design approach meets the minimum traffic restriction requirements given in the RFP. In particular provide structural input that will impact roadway geometrics (***PPM***, Volume 1, Chapter 2) and the traffic control plan (***PPM***, Volume 1, Chapter 10).

FDOT Explanation:

The Department wants to ensure that Structures Designers are coordinating with the Roadway Design Engineer for any and all impacts that structure construction may have on roadway geometrics and traffic control plans.

Modifications To The 2013 Structures Manual VOL 1: The Structures Design Guidelines

Daniel L. Scheer, P.E.

Structures Manual Volume 1: SDG

- **1 GENERAL REQUIREMENTS**
  - ✓ **I.2.** **Revised Paragraph B. Added Paragraph C.**
  - ✓ **I.3.** **Added introductory paragraph.**
  - ✓ **1.3.2.** **Revised link in Paragraph B. Added Paragraph E per SDB C12-02 and revised per SDB 12-08.**
  - ✓ **1.4.1.** **Revised Paragraph A to delete reference to Florida aggregate.**
  - ✓ **1.4.2.** **Reorganized Table 1.4.2-1 and added requirements for Noise Wall Posts and Panels and Auger Cast Piles.**
  - ✓ **1.4.4.** **Added Paragraphs C.3 and C.4. Added Figure 1.4.4-1.**
  - ✓ **1.5.** **Revised Paragraph A and expanded Commentary.**
  - ✓ **1.6.1.** **Reorganized Paragraph A.**
  - ✓ **1.6.2.** **Clarified requirements of Paragraphs B and E and Commentary.**
  - ✓ **1.6.3.** **Revised Paragraph A.**

Structures Manual Volume 1: SDG

- **1.3 ENVIRONMENTAL CLASSIFICATIONS**
- **1.3.2 Classification Criteria (Rev. 01/13) – Cont'd**

E. Requirements for the use of uncoated weathering steel superstructures are as follows. See also SDG 5.12.

1. Uncoated weathering steel superstructures may be used if the structure is located 4.0 miles or more from the coast regardless of the superstructure environmental classification. Vertical and horizontal clearances to a body of water shall comply with the following requirements:

a. For structures over a body of water, the minimum vertical clearance over mean or normal high water shall be at least 12 feet for a body of water with chloride concentrations less than 6000 ppm and at least 25 feet for a body of water with chloride concentrations equal to or greater than 6000 ppm.

b. For structures adjacent to a body of water, the minimum horizontal clearance shall be at least 25 feet from a body of water with chloride concentrations less than 6000 ppm and at least 100 feet from a body of water with chloride concentrations equal to or greater than 6000 ppm.

Structures Manual Volume 1: SDG

- **1.3.2 Classification Criteria (Rev. 01/13) – Cont'd**

2. For structures located within 4.0 miles of the coast, the use of uncoated weathering steel superstructures may be considered if site conditions, as determined by the State Materials Office, satisfy each of the following criteria:

a. The maximum airborne salt deposition rate, as determined by ASTM Test G140, is less than 5 mg/m^2/day (measured over a 30 day period).

b. The maximum average concentration for SO_2, as determined by ASTM Test G91, does not exceed 60 mg/m^2/day (measured over a 30 day period).

c. Yearly average Time of Wetness (TOW), as determined by ASTM Test G84, does not exceed 60%.

Vertical and horizontal clearances to a body of water shall be site specific as determined by the State Materials Office. The minimum vertical clearance so determined will not be less than 12 feet above mean or normal high water.

Modification for Non-Conventional Projects:
Follow the requirements of ***SDG*** 1.3.2.E unless otherwise shown in the RFP.

Structures Manual Volume 1: SDG

- **1.3.2 Classification Criteria (Rev. 01/13) – Cont'd**

FDOT Explanation:

The Department designates a radius ('as a crow flies') from the closest edge of the structure to the coast point as the benchmark for determining the 4.0 mile restriction, regardless of project delivery method.

The vertical and horizontal clearances are designated to avoid sea-spray from continually wetting the weathering steel surface. Greater distances are specified for high-chloride content water bodies.

Structures Manual Volume 1: SDG

- **1.4 CONCRETE AND ENVIRONMENT [5.12.1]**
- **1.4.1 General (Rev. 01/13)**

A. Use K1 = 0.9 as the correction factor when calculating the Modulus of Elasticity in LRFD [5.4.2.4]. Use wc = 0.145 kcf.

Commentary: These values are based on the use of Florida limerock aggregate.

Modification for Non-Conventional Projects:
Delete ***SDG*** 1.4.1.A and insert the following:
A. If Florida limerock coarse aggregate or other similar limerock aggregate is used in design, use K_1 = 0.9 as the correction factor when calculating the Modulus of Elasticity in ***LRFD*** [5.4.2.4]. For concrete made with limerock coarse aggregate, use w_c = 0.145 kcf.

FDOT Explanation:

The Department Materials Office has specified these values for FL Limerock Aggregate Concrete.

Structures Manual Volume 1: SDG

- **1.4 CONCRETE AND ENVIRONMENT [5.12.1]**
- **Table 1.4.2-1 Concrete Cover (Rev. 01/13)**

FDOT Explanation:

1. **Added the word "ALL" for clarification.**
2. **Changed the word 'girder' to "BEAM" as 'girder' may apply to various types of superstructure designs.**
3. **Added "Noise Wall Posts and Panels" cover requirement of 2".**
4. **Added "BEAM" for inclusiveness.**
5. **Reduced the cover requirement for Auger Cast Piles from 6" to 4".**
   a) **See FHWA Technical Bulletins for Drilled Shaft & Auger Pile definitions.**
   b) **Auger Cast Piles are currently NOT permitted on FDOT Bridge Projects.**

Component (Precast and Cast-in-Place)	Concrete Cover (inches)	
	S or M[1]	E[1]
Superstructure		
All 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 beam top flange	1	
Top deck surfaces: Short Bridges[2]	2	
Top deck surfaces: Long Bridge[2]	2½[3]	
All components and surfaces not included above (including barriers and wall copings)	2	
Noise Wall Posts and Panels	2	
Substructure		
External surfaces cast against earth and surfaces in contact with water	4	4½
Exterior formed surfaces, columns, and tops of footings not in contact with water and all components or surfaces not included elsewhere	3	4
Internal surfaces	3	
Beam/Girder Pedestals	2	
Prestressed Piling	3	
Spun Cast Cylinder Piling[4]	2	
Drilled Shafts	6	
Auger Cast Piles	4	
Retaining Walls (Excluding MSE walls[5])	2	3
Culverts	2	3
Bulkheads	4	

Structures Manual Volume 1: SDG

- **1.4 CONCRETE AND ENVIRONMENT [5.12.1]**
- **1.4.4 MASS CONCRETE (Rev. 01/13)**

3. Segmental Superstructure Pier and Expansion Joint Segments: Provide for mass concrete when design concrete strengths greater than 6500 psi are used regardless of the ratio of volume to surface area. For design concrete strengths less than or equal to 6500 psi, provide for mass concrete when the ratio of volume to surface area is greater than 1 foot. Consider interior core volume and use only the surface area exposed to air. Do not include wings, as well as flange or web extensions beyond the core. Make no deductions for post-tensioning ducts, minor utilities less than 6" diameter, etc. See Figure 1.4.4-1 for a representation of the "interior core" (shown in red) to be considered. For cases when typical precast segments are used as a form "shell" for cast-in-place diaphragm core concrete, do not consider the "shell" concrete dimensions in determining the ratio. Consider only the monolithically-poured core concrete limits for volume and the surface area of that volume that is exposed to air.

Structures Manual Volume 1: SDG

- **1.4.4 MASS CONCRETE (Rev. 01/13) – Cont'd**

Commentary: The intent is to consider the full volume of monolithically-poured concrete contributing to heat of hydration, neglecting the large surface area regions in the outer extremities that would tend to unconservatively skew the calculation. Also, neglecting the core surface area not directly exposed to air is a conservative assumption accounting for the fact that these regions are partially insulated by the adjacent concrete. The volume to surface ratio is not used to determine if mass concrete provisions are necessary for pier and expansion joint segments when design concrete strengths greater than 6500 psi are used. Instead, all such segments are assumed to be constructed of mass concrete because of the potential for the development of higher heat of hydration temperatures that are associated with higher strength concrete mixes.

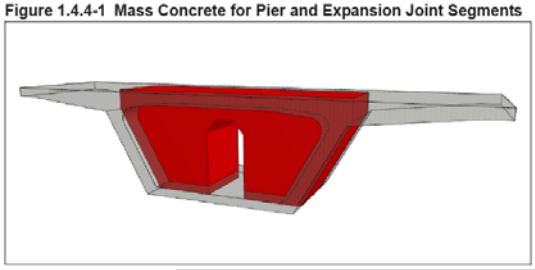
4. Straddle and Integral Pier Caps: Provide for mass concrete when design concrete strengths greater than 6500 psi are used regardless of the ratio of volume to surface area. For design concrete strengths less than or equal to 6500 psi, provide for mass concrete when the ratio of volume to surface area is greater than 1 foot.

Structures Manual Volume 1: SDG

- **1.4.4 MASS CONCRETE (Rev. 01/13) – Cont'd**

Commentary: These requirements are based on those used for segmental superstructure pier and expansion joint segments. See also Commentary above.

Figure 1.4.4-1 Mass Concrete for Pier and Expansion Joint Segments



FDOT Explanation:

The Department has found through construction experience that Segmental Diaphragms (region where tendons are anchored), Integral Pier Caps and Integral Straddle Bents act as 'mass concrete' during the curing phase on construction and shall be treated as such for concrete strengths above 6500psi.

2013 Design Training Expo

Structures Manual Volume 1: SDG

- **1.5 EXISTING HAZARDOUS MATERIAL (Rev. 01/13)**

A. Survey the project to determine if an existing structure contains hazardous materials such as lead-based paint, asbestos-graphite bearing pads, asbestos-cement drain pipes (scuppers), other asbestos-containing materials, etc. Information will be provided by the Department or by site testing to make this determination. Coordinate with the District Asbestos Coordinator for issues relating to asbestos-containing materials.

Commentary: Previous FDOT Standards allowed the use of asbestos-cement (transite) pipes for some bridge deck scuppers. These pipes may exist in some older bridges.

If lead based paint or asbestos containing materials exist anywhere on the existing structure, indicate on the plans that the structure contains lead based paint or asbestos containing materials, as appropriate, for the purpose of triggering the protection, or removal and disposal requirements in the Specifications.

Modification for Non-Conventional Projects:
Delete first sentence of ***SDG*** 1.5.A and see the RFP for requirements.

2013 Design Training Expo

Structures Manual Volume 1: SDG

- **1.5 EXISTING HAZARDOUS MATERIAL (Rev. 01/13) – Cont'd**

FDOT Explanation:

Previous FDOT Standards and Specifications called for the use of materials that are now classified as Hazardous Materials. Older bridges that are anticipated for repair or demolishing must be researched and/or surveyed to determine if these materials were permitted for use on that structure at the time of construction and if in fact the structure has these items incorporated into the structure. A notation on the plans will then trigger the protection, or removal and disposal requirements in the Specifications.

Structures Manual Volume 1: SDG

- **1.6 POST-INSTALLED ANCHOR SYSTEMS**
- **1.6.1 General (Rev. 01/13)**

A. Post-Installed Anchor Systems are used to attach new construction to existing concrete structures. Post-Installed Anchor Systems shall be limited to:

1. Adhesive Bonded Anchor Systems with adhesive bonding material listed on the Department's Qualified Products List (QPL).
2. Undercut Anchor Systems as approved on a project-by project basis by the District Structures Design Engineer and the State Structures Design Engineer.

FDOT Explanation:

Post-Installed Anchor Systems require the approval of BOTH the District and State Structures Design Engineer. Careful attention must be paid to the location and use of these anchor systems therefore mandating the State review. There is a concerted effort to be consistent with the application of Post-Installed Anchors on FDOT projects.

Structures Manual Volume 1: SDG

- **2 LOADS AND LOAD FACTORS**
  - ✓ **2.1.2.** **Deleted last two sentences of Paragraph B Commentary.**
  - ✓ **2.2.** **Updated Table 2.2-1.**
  - ✓ **2.3.1.** **Clarified requirements of first Paragraph.**
  - ✓ **2.3.2.** **Clarified the requirements of Paragraph A.**
  - ✓ **2.4.1.** **Revised second part of Paragraph A.**
  - ✓ **2.6.1.** **Replaced Paragraph A per SDB 12-04.**
  - ✓ **2.6.3.** **Modified Paragraphs A and B per SDB 12-04.**
  - ✓ **2.6.4.** **Modified Paragraphs C.1 and C.2 per SDB 12-04.**
  - ✓ **2.6.5.** **Revised Paragraphs A and C.**
  - ✓ **2.6.7.** **Added cross reference to PPM in Paragraph A. Replaced Paragraph H per SDB 12-04.**
  - ✓ **2.11.4.** **Added cross reference to Paragraph F and revised Commentary.**
  - ✓ **2.12.** **Revised titles and content of Sections 1 and 2. Revised Eq. 2-5.**
  - ✓ **2.13.** **Added new section.**

Structures Manual Volume 1: SDG

- **2.4 POST-INSTALLED ANCHOR SYSTEMS**
- **2.4.1 Wind Pressure on Structures: WS (Rev. 01/13)**

A. General

Wind speed higher than shown in Table 2.4.1-2 may be used if warranted by site historical data or special site-specific terrain affecting wind speeds. Use ASCE-7 as required for special conditions.

FDOT Explanation:

Simplifying the requirement details by only using standard ASCE-7 provisions.

Structures Manual Volume 1: SDG

- **2.6 VEHICULAR COLLISION FORCE [3.6.5]**
- **2.6.1 General (Rev. 01/13)**

A. Design structures according to LRFD [3.6.5] and this section. Calculate the annual frequency for a pier to be hit by a heavy vehicle using LRFD C3.6.5.1. Determine the ADTT based on the design year AADT on the lower roadway. Grade separation bridges carrying Interstate or other high speed limited access roadways are considered critical for this evaluation. The Department will determine if other grade separation bridges are critical for heavy vehicle impact loading using the following items:

- Existing and projected traffic volumes on the bridge
- Structure type, in particular continuous spans or integral piers
- Route impacts on local residents and businesses
- Availability and length of detours
- Evacuation/emergency response routes
- Estimated duration/difficulty/cost of bridge damage repair or replacement
- Other safety and economic impacts due to the loss of the structure

Structures Manual Volume 1: SDG

- **2.6.1 General (Rev. 01/13) – Cont'd**

Commentary: When a bridge is determined to be critical, which pier design strategy (shielding or designing for the equivalent static load) is selected will depend on the design and geometrics of the pier itself and the overall roadway configuration near the pier, e.g., other requirements for the use of adjacent roadside barriers, sight distance limitations, geometrics of the lower roadway.

Modification for Non-Conventional Projects:
Delete ***SDG*** 2.6.1.A and insert the following: A. Design structures according to ***LRFD*** [3.6.5] and this section. Calculate the annual frequency for a pier to be hit by a heavy vehicle using ***LRFD*** C3.6.5.1. Determine the ADTT based on the design year AADT on the lower roadway. Grade separation bridges carrying Interstate or other high speed limited access roadways are considered critical for this evaluation. See the RFP for requirements for all other bridges.

FDOT Explanation:

Incorporate SDB 12-04. Intent is to focus on 'Practical Design' of pier shielding and protection. It is important to take all relevant site conditions and design parameters into consideration with the decision process.

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- **2.6 VEHICULAR COLLISION FORCE [3.6.5]**
- **2.6.3 New Structures Over or Adjacent to Roadways (Rev. 01/13)**

A. Design all piers located within the setback distance for the LRFD equivalent static force, or shield piers using Design Standards Index 411 Pier Protection Barriers or other similar Test Level 5 barriers if the calculated annual frequency for the pier to be hit by a heavy vehicle is greater than or equal to 0.0001 for critical bridges or 0.001 for typical (non-critical) bridges. Utilize the shear reinforcement required at the pier base to a distance of 8 feet above the adjacent ground surface.

B. Provide roadside barriers in accordance with PPM, Volume 1, Chapter 4 for piers located within the clear zone or horizontal clearance limits and that are not shielded using Design Standards Index 411 Pier Protection Barriers or other similar Test Level 5 barriers as described above.

FDOT Explanation:

Incorporation of 'Practical Design'.

A. Provide specific guidance on Annual Frequency to eliminate ambiguity in the Guideline.

B. If Piers are protected/shielded using Index 411, or other TL-5 Barriers, then additional road-side barriers are not necessary at this location.

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- **2.6 VEHICULAR COLLISION FORCE [3.6.5]**
- **2.6.7 Structures Over or Adjacent to Railroad and Light Rail Tracks (Rev. 01/13)**

H. In addition to the above requirements, as conditions warrant or as directed by the Department, provide crash walls with a minimum height of 6 feet above the top of rail for bridge piers located more than 25 feet from the centerline of track. Consider the horizontal alignment of the track, adjacent embankment height, and assess the consequences of serious damage to the bridge in the case of a collision.

Modification for Non-Conventional Projects:
Delete ***SDG*** 2.6.7.H and see the RFP for requirements.

FDOT Explanation:

This is an additional requirement to the stated AREMA requirements. This allows latitude for the Department to provide for crash walls under conditions that are determined to be critical (i.e. horizontal curvature of track/bridge at location, anticipated train speed, criticality of bridge structure, etc.)

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- **2.13 CONSTRUCTION LOADS [3.6.5] (Rev. 01/13)**

  When the reduced load factor as allowed by LRFD C5.14.2.3.4b is used for substructures supporting segmental bridges, the reduced load factor for CLL shall not be less than 1.35 for Strength I and 1.25 for Strength V. A reduction in the load factor for WE is not allowed.

  Commentary: LRFD currently allows for a reduced load factor as appropriate for CLL and WE but has not defined a lower limit.

FDOT Explanation:

This is a requirement to avoid any ambiguity with the designers and specialty engineer's erection analysis of Segmental Bridge structures that utilize the substructure for support during erection.

Structures Manual Volume 1: SDG

- **3 SUBSTRUCTURE, RETAINING WALLS AND NOISE WALLS**
  - ✓ **3.1.** **Updated LRFD references and added culverts to list of structure types in Paragraph A. Added Paragraph F and Table 3.1-1.**
  - ✓ **3.2.** **Deleted Paragraph F and renumbered subsequent Paragraph.**
  - ✓ **3.3.** **Added new Paragraph B and renumbered subsequent Paragraph.**
  - ✓ **3.5.1.** **Clarified requirements of Paragraph F.4.**
  - ✓ **3.5.2.** **Revised Paragraph A.**
  - ✓ **3.5.3.** **Revised Paragraphs A and B and Table 3.5.3-1 and relocated requirements to Paragraph 3.1.F and Table 3.1-1. Changed Section Title to Sheet Piles. Renumbered Subsequent Paragraphs. Revised new Paragraphs A.1 and B.2.**
  - ✓ **3.5.6.** **Revised Table 3.5.6-1.**
  - ✓ **3.5.10.** **Deleted Embedded Data Collectors from Paragraph C. Deleted Paragraph F and associated Commentary.**
  - ✓ **3.6.11.** **Added new Section.**
  - ✓ **3.8.** **Deleted Paragraph C and renumbered subsequent Paragraph.**

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- **3.1 GENERAL (Rev. 01/13)**

F. Corrosion Mitigation Measures for Steel Piles and Wall Anchor Bars are as follows:

1. To account for a reduction in steel cross section due to corrosion, add coatings and/or sacrificial steel thickness to all permanent steel substructure and wall components as shown in Table 3.1-1. Coat steel piles fabricated with weathering steel in the same manner as steel piles fabricated with conventional steels. Depict design ground surface or the design scour depth in plans.
2. Closed-End Pipe piles with a cast-in-place reinforced concrete core (fully redundant load path) may be used in any environment. The cast-in-place reinforced concrete core must extend the full length of the pile and must resist all design loads without any contribution from the steel pipe. The sacrificial thickness specified in Table 3.1-1 and painting per Specification Section 560 are not required.

Commentary: In this case the Closed-End Pipe pile is essentially a permanent casing and is not considered as a load carrying element.

FDOT Explanation:

Requirements are based on research and field results from steel pipe piles used in actual Florida Projects.

Structures Manual Volume 1: SDG

- **3.5 DRIVEN PILES**
- **3.5.1 Prestressed Concrete Piles [5.13.4.4] (Rev. 01/13)**

F. Minimum Sizes.

1. Fender Systems: 14-inch square piling.
2. Bridges: 18-inch square piling.
3. Bridges (Extremely Aggressive Environment due to chlorides): 24-inch square piling.
4. On “Extremely Aggressive” salt-water sites, 24 inch piles or larger are required. For minor widenings, smaller piles may be acceptable with the approval of the District Structures Maintenance Engineer or his designated representative. This decision is dependent upon site-specific conditions and the history of piles in the vicinity. If pile bents will be exposed to wet/dry cycles that could necessitate future jacketing, a minimum 24-inch pile must be used. See SDG 10.4 for minimum piling for pedestrian bridges. The District Structures Maintenance Engineer may grant exemptions for fishing piers.

FDOT Explanation:

Smaller Diameter Piles in ‘Extremely Aggressive’ environments has shown a history of more rapid degradation due to chloride intrusion.

Structures Manual Volume 1: SDG

- **3.6 DRILLED SHAFT FOUNDATIONS**
- **3.6.11 Axial Resistance of Drilled Shafts [5.7.4.4] (Rev. 01/13)**

For determining the factored axial resistance for drilled shafts, reduce the gross area of section, Ag to the area bounded by the outside diameter of the spiral or tie plus 2 inches of concrete cover.

Commentary: The Department requires 6 inches of concrete cover for all drilled shafts. The structural equations given in LRFD 5.7.4.4 were based on testing performed on columns with reduced concrete cover.

FDOT Explanation:

The Department prefers this conservative approach to account for construction tolerances and the LRFD testing based on reduced cover.

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- **3 SUBSTRUCTURE, RETAINING WALLS AND NOISE WALLS**
  - ✓ **3.8.** **Deleted Paragraph C and renumbered subsequent Paragraph.**
  - ✓ **3.10.** **Revised Paragraph E.**
  - ✓ **3.11.** **Reorganized entire section. Added criteria for Inverted-T Piers. Added second sentence of Paragraph 3.11.2.B.1. Revised Paragraph 3.11.2.B.5. Revised height of solid section in Paragraph 3.11.3.F to 8 feet.**
  - ✓ **3.12.** **Clarified requirements of Paragraph A.**
  - ✓ **3.12.12.** **Replaced Section per SDB 12-06.**
  - ✓ **3.13.2.** **Revised Paragraphs F.2, G.1 and J.5. Deleted Paragraph P per SDB 12- 06.**
  - ✓ **3.13.3.** **Revised Paragraphs B, C and D.**
  - ✓ **3.13.4.** **Added Section per SDB 12-06.**
  - ✓ **3.14.** **Replaced Section per SDB 12-14.**
  - ✓ **3.15.8.** **Revised Paragraphs D and E.**

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- **3.11 PIER, CAP, COLUMN, AND FOOTING DESIGN (Rev. 01/13)**
- **3.11.1 General**

EXTENSIVE REWORK OF SECTION 3.11 – PLEASE REVIEW FOR DETAILS.

D. For precast struts set into, cast into or placed against cast-in-place concrete within the splash zone, maintain concrete cover over the entire interfacing surfaces of both the precast strut and the cast-in-place concrete. Connect precast struts to cast-in-place concrete using only stainless steel or non-metallic reinforcement.

Commentary: Experience has shown that CIP concrete pulls away from a precast strut at their interface allowing water and/or chlorides to enter and initiate corrosion.

E. On structures over water, vertical post-tensioning strand (except in cylinder piles) cannot extend below an elevation that is 12 feet above Mean High Water Level (MHW) or Normal High Water Level (NHW), regardless of the Environmental Classification. Post-tensioning bars are excluded from this restriction.

FDOT Explanation:

No particular explanation required – simply highlighting some requirements that are especially important to the SDO.

Structures Manual Volume 1: SDG

- **3.12.12 Geosynthetic Reinforced Soil (GRS) Walls and Abutments (Rev. 01/13)**

Commentary: The use of GRS walls and abutments may be precluded because of insufficient room to place the soil reinforcement, poor insitu soils, locations with excessive stream flow or wave action, etc.

E. Use of GRS walls and abutments on the Interstate or on other highways with abutments carrying 2 or more lanes in a single direction or 4 or more lanes in two directions requires the approval of the State Structures Design Engineer. Their use will typically be restricted and not approved for use on water crossings subject to stream flow in excess of 9 ft/sec, or locations with sufficient wave action to displace scour countermeasures.

Modification for Non-Conventional Projects:
Delete ***SDG*** 3.12.12.E and insert the following:
E. GRS is not allowed for abutments on the Interstate or on other highways with abutments carrying 2 or more lanes in a single direction or 4 or more lanes in two directions, unless specifically stated in the RFP.

FDOT Explanation:

The Department now allows the use of GRS Walls and Abutments with the approval of the State Structures Design Engineer.

Structures Manual Volume 1: SDG

- **3.13 RETAINING WALL DESIGN**
- **3.13.3 Permanent and Critical Temporary Sheet Pile Walls (Rev. 01/13)**

B. Determine the required sheet pile section in accordance with LRFD [11.8.5], using the normal load and resistance factors for each load case.

C. When the supported paved roadway will not be paved or resurfaced after the wall deflects, the design horizontal deflection shall not exceed 1-1/2 inches.

D. When the supported paved roadway will be paved or resurfaced after the wall deflects, or the supported roadway is unpaved, the design horizontal deflection shall not exceed 3 inches.

FDOT Explanation:

The Department permits twice the temporary sheet pile wall movement when supported roadways will be resurfaced after construction or if the supported roadway is unpaved.

Structures Manual Volume 1: SDG

- **3.13 RETAINING WALL DESIGN**
- **3.13.4 GRS Walls and Abutments (Rev. 01/13)**

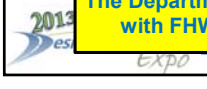
Commentary: FHWA Publication No. FHWA-HRT-11-026 "Geosynthetic Reinforced Soil Integrated Bridge System Interim Implementation Guide" (GRS Guide) outlines recommended practice for the design and construction of GRS-IBS. FHWA Publication FHWA-HRT-11-027 "Geosynthetic Reinforced Soil Integrated Bridge System Synthesis Report" provides background information and fundamental characteristics of GRS-IBS.

A. Design GRS abutments in accordance with the LRFD methodology contained in Appendix C of the FHWA-HRT-11-026 "Geosynthetic Reinforced Soil Integrated Bridge System Interim Implementation Guide", except as otherwise described in this section.

B. GRS abutments may be used to support single span bridges not exceeding 140 feet and which are not at risk of movement due to transverse loading, uplift, etc. GRS Abutments may also be considered for multi-span bridges with simply supported end spans.

FDOT Explanation:

The Department now allows the use of GRS Walls and Abutments in accordance with FHWA guidelines.



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- **3.14 FENDER SYSTEMS (Rev. 01/13)**
- **3.14.1 General**

A. …Limit deflections to avoid contact with pier footings when possible and to allow for vessel impacts without potential for pocketing or snagging and to avoid unnecessary damage to, and maintenance of, the fender system. Coordinate with the District Structures Design Engineer or District Structures Maintenance Engineer to determine the maximum allowable deflection of the fender system acceptable for the project. Place these required fender system deflection limitations in the plans.

FDOT Explanation:

The goal of the Fender System is to keep vessels from striking a bridge – therefore, deflections should be kept to a threshold that will prevent the fender/vessel from contact with the bridge structure should an arrant vessel hit the fender system protecting the structure.

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- **3.14 FENDER SYSTEMS (Rev. 01/13)**
- **3.14.1 General**

D. Acceptable delivery methods of fender system plans include:

2. A Contractor prepared custom designed fender system based on site-specific design information for use at locations with or without steel-hulled commercial barge traffic. A Contractor prepared custom design is required where: a. The "Required Freestanding Pile Height" is greater than the "Freestanding Pile Height" assumed in Paragraph 3.14.3.E.1. b. The standard geometry shown on Design Standards Index 21900 cannot be used.

Commentary: A Contractor prepared custom design will be allowed, at the Contractor's option, on all projects per the Specifications. The SDO and polymeric fender industry both prefer the use of Contractor prepared custom designs. This delivery method will ensure optimization and efficiency of the fender system, thereby reducing the cost.

FDOT Explanation:

The Department recoginizes that a 'one-size fits all' approach to fenders is not feasible with the polymeric fender systems that are preferred. A custom design meeting the requirements that accounts for all local conditions (soil, free-height and vessel traffic) is now permitted.

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- **3 SUBSTRUCTURE, RETAINING WALLS AND NOISE WALLS**
  - ✓ **3.16.2.** **Revised wall and panel height requirements.**
  - ✓ **3.16.4.** **Deleted minimum wind load pressure.**
  - ✓ **3.16.5.** **Added last Paragraph per SDB 12-04.**
  - ✓ **3.17.** **Added new Section.**
- **4 SUPERSTRUCTURE – CONCRETE**
  - ✓ **4.1.8.** **Revised Section.**
  - ✓ **4.2.8.** **Revised Paragraphs D, E and F.**
  - ✓ **4.2.13.** **Added Provisions for Florida-U Beams.**
  - ✓ **4.2.15.** **Added new Section and Figure.**
  - ✓ **4.3.1.** **Revised Paragraphs C.2, C.3 and C.4.**
  - ✓ **4.6.1.** **Deleted Paragraph A.2.**

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- **3.16 NOISE WALL DESIGN**
- **3.16.2 General Features - Panel Height [15.4] and Post Spacing (Rev. 01/13)**

Total wall heights range from a minimum of 12 ft to a maximum of 22 ft. The height of individual panels must be a minimum of 6 ft, except for the following: the panel height may be a minimum of 4 ft when required due to low clearance conditions or when graphics must be accommodated in walls with total heights between 12 ft. and 14 ft. Where fire hose access holes are required, the bottom panel must be at least 6 feet high to allow forming of the access hole. Where an access door is required, the bottom panel must be a minimum of 8 feet high to allow forming and installation of a 6'-0" high door..

FDOT Explanation:

The Department has directed the Noise Wall dimensions to standardize the panel sections to facilitate cost efficiencies with a standard dimension configuration. See the Standard Index for details.

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- **3.16 NOISE WALL DESIGN**
- **3.16.4 Wind Loads [3.8.1][15.8.2] (Rev. 01/13)**

  For ground mounted noise wall design, replace LRFD [15.8.2] in its entirety with SDG 2.4.1.

FDOT Explanation:

The Department has directed that Noise Wall Design be in accordance with SDG 2.4.1 due to the unique circumstances associated with Tropical Weather in Florida.

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- **3.16 NOISE WALL DESIGN**
- **3.16.5 Wind Loads [3.8.1][15.8.2] (Rev. 01/13)**

  In LRFD [15.8.5], replace paragraphs 4 thru 9 with the following:

  On flush shoulder roadways, locate noise walls outside the clear zone unless shielded, and as close as practical to the right-of-way line. On urban curbed roadways, the front face of the noise wall posts shall be a minimum of 4 feet behind the face of the curb. Additional setbacks may be required to meet minimum sidewalk requirements. Noise walls may be combined with traffic railings on a common foundation if the combination meets the crash test requirements of NCHRP 350 or the Manual for Assessing Safety Hardware (MASH) Test Level 4 criteria.

  Noise walls should not be located on bridge structures where feasible alternative locations exist. Noise walls on bridge structures cause a disproportionate increase in bridge cost because of strengthening of the deck overhang and exterior girder. In addition, noise walls on bridges interfere with normal maintenance inspection access and detract from the aesthetic quality of the structure. See Design Standards, Index 5210 and 5212 for acceptable crash tested 8 ft. bridge and retaining wall mounted noise walls.

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- **3.16.5 Vehicular Collision Forces [15.8.5] (Rev. 01/13) – Cont'd**

  Traffic railing mounted noise walls and combination traffic railing / noise walls must meet the requirements of PPM Volume 1, Section 7.1.2.1. The criteria specified in LRFD 15.8.4 may be used to design test specimens for crash testing.

FDOT Explanation:

The Department has stated these preferences due to the challenges associated with having a new traffic railing / noise wall configuration crash tested and/or approved to meet the NCHRP 350 or MASH Test Level 4 criteria.

Setback distances reflect the minimum allowable to prevent intrusion into the collision zone.

Noise Walls on bridge railings may unnecessarily impact the deck / wing design and should be avoided if possible.

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- **3.17 CONCRETE DRAINAGE STRUCTURES (Rev. 01/13)**
- **3.17.1 General**

  Use PPM Volume 2, Chapter 14 for drainage structure plans preparation in conjunction with the design requirements of this Section for special designs not included in the Design Standards. Refer to SDG Chapter 1 for the box culvert concrete class (Table 1.4.3-1) and reinforcing steel (Table 1.4.3-1) cover requirements for non-standard drainage structures.

FDOT Explanation:

The Department has added an entire section (3.17) dedicated to Concrete Drainage Structures.

Structures Manual Volume 1: SDG

- **4.2 DECK SLABS [5.13.1][9.7]**
- **Thickened Slab End Requirements (Rev. 01/13)**

For pretensioned simple span Florida-I and Florida-U Beam bridges, design thickened slab end at locations of slab discontinuity not supported by full depth diaphragms. See SDM Chapter 15 for thickened slab end details for Florida-I Beams (Florida-U Beam details are similar between adjacent beams). Do not thicken slab at intermediate supports within Florida-I and Florida-U Beam simple span units where the deck slab is continuous.

FDOT Explanation:

The Department decided to eliminate End-Diaphragms by utilizing a thickened end-slab detail at Expansion Joints on FIB / FUB simple span bridges. This Innovative Initiative should decrease both construction time and cost.

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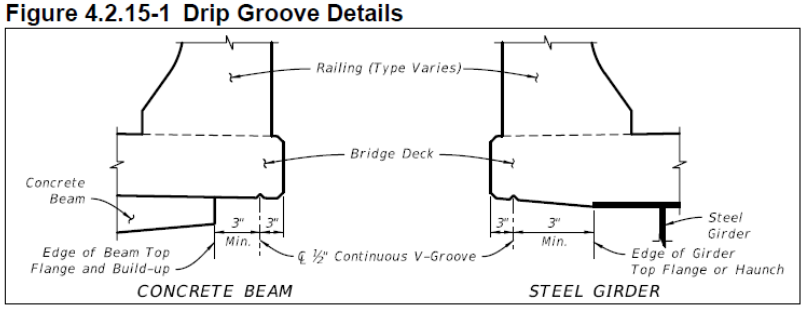
- **4.2 DECK SLABS [5.13.1][9.7]**
- **4.2.15 Drip Grooves (Rev. 01/13)**

Provide a ½" continuous V-groove adjacent to deck copings as shown in Figure 4.2.15-1 for all concrete decks. For beam and girder supported concrete decks, provide sufficient cantilever length on both sides of the deck to accommodate the V-grooves.

Figure 4.2.15-1 Drip Groove Details



FDOT Explanation:

Self - Explanatory.

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- **4.3 PRETENSIONED BEAMS**
- **4.3.1 General (Rev. 01/13)**

2. Whenever possible, separate debonded strands in all directions by at least one fully bonded strand and debond strands outside the horizontal limits of the web. The percentage of debonded strands may exceed the recommended 25% limit in LRFD 5.11.4.3, provided that all strands within the horizontal limits of the web are fully bonded. In no case shall the percentage of debonded strands exceed 30%.

Commentary: LRFD requires "the number of partially debonded strands should not exceed 25 percent of the total number of strands". Using the word "should" instead of "shall" signifies the specifications allow some deviation from the 25% limit. Recent testing of FIB's under FDOT Project BDK75 977-05 indicates the number of debonded strands can safely exceed the 25% limit when the LRFD 5.8.3.5 longitudinal reinforcement (tension tie) is provided and the fully bonded strands are grouped close to the web. The 30% debonding limitation is a conservative interim limit until further research is completed under NCHRP Project 12-91.

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- **4.3.1 General (Rev. 01/13) – Cont'd**

3. When analyzing stresses of simple span beams, limit stresses in accordance with LRFD Table 5.9.4.1.2-1 with the exception that for the outer 15 percent of the design span of straight longitudinal beams, tensile stress at the top of beam at release may be taken as $0.24\sqrt{f'_{ci}}\,[ksi]\,(7.5\sqrt{f'_{ci}}\,[psi])$ when the lesser of LRFD C5.9.4.1.2 or Table 4.3.1-2 minimum tension reinforcement is developed in the section.

Commentary: Since the mid 1980's, the Department has allowed a limit $12\sqrt{f'_{ci}}$ tension in the top of the beam at release knowing the actual tension was less due to the additional compression provided by the top partially stressed (dormant) strands. Now that design software accounts for partially stressed top strands, a $12\sqrt{f'_{ci}}$ tension limit is no longer justified. When the minimum areas of tension reinforcement shown in the table are provided, refined analysis shows top tensile beam stresses are within reasonable limits. Since the method suggested in LRFD C5.9.4.1.2 may give an unreasonably large required area of reinforcement at locations near the prestress transfer length, minimum reinforcement areas are given in the table for FDOT standard beams.

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- **4.3.1 General (Rev. 01/13) – Cont'd**

4. The minimum compressive concrete strength at release, f 'ci, shall be the greater of 4.0 ksi or 0.6 f 'c. The maximum design concrete compressive strength at release shall be the lesser of 0.8 f 'c or 6.0 ksi.

Modification for Non-Conventional Projects:
Delete ***SDG*** 4.3.1.C.4 and insert the following: 4. The minimum compressive concrete strength at release, **f 'ci**, shall be the greater of 4.0 ksi or 0.6 **f 'c**.

FDOT Explanation:

The Department is updating the allowable and limit stresses based on research findings and FIB behavior.

Structures Manual Volume 1: SDG

- **5 SUPERSTRUCTURE – STEEL**
  - ✓ **5.1.** **Deleted Paragraph A and renumbered subsequent Paragraphs. Added cross reference to G13.1.**
  - ✓ **5.3.1.** **Revised entire Section based on SDB C12-02.**
  - ✓ **5.6.2.** **Deleted Paragraph A.2.**
  - ✓ **5.11.2.** **Revised Paragraph C.**
  - ✓ **5.12.** **Replaced section per SDB C12-02.**

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- **5.3 STRUCTURAL STEEL [6.4.1]**
- **5.3.1 General (Rev. 01/13)**

A. Use weathering steel (ASTM A 709 Grades 50W, HPS 50W, and HPS 70W) left uncoated for all new steel I-girder and Box-girder bridges unless prohibited by site conditions or otherwise approved by the Chief Engineer. Miscellaneous hardware, including shapes, plates, and threaded bar stock, (except when used on uncoated weathering steel structures) shall conform to ASTM A709, Grade 36. Do not use ASTM A 709 Grade HPS 100W steel without prior approval of the SDO. SDG 1.3 provides guidelines on suitable site conditions. See also FHWA Technical Advisory T5140.22 for additional information.

Modification for Non-Conventional Projects:
Delete ***SDG*** 5.3.1.A and insert the following:
A. Use weathering steel (ASTM A 709 Grades 50W, HPS 50W, and HPS 70W), left uncoated, for all new steel bridges unless prohibited by site conditions or otherwise stated in the RFP. Miscellaneous hardware, including shapes, plates, and threaded bar stock, (except when used on uncoated weathering steel structures) shall conform to ASTM A709, Grade 36. Do not use ASTM A 709 Grade HPS 100W steel. ***SDG*** 1.3 provides guidelines on suitable site conditions. See also FHWA Technical Advisory T 5140.22 for additional information.

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- **5.12 CORROSION PROTECTION (Rev. 01/13)**

A. The default treatment for new steel I-girder and box-girder bridges is uncoated weathering steel where site conditions warrant (See SDG 1.3.2). An Inorganic Zinc Coating System shall be used where site conditions preclude uncoated weathering steel and may be used elsewhere with approval of the Chief Engineer. Use of a High Performance Coating System to any extent for new Steel I-Girder or Box-Girder bridges requires written approval from the Chief Engineer. Other systems must be approved by the State Materials Office (SMO).

Modification for Non-Conventional Projects:
Delete ***SDG*** 5.12.A and insert the following:
A. The default treatment for new steel I-girder and box-girder bridges is uncoated weathering steel where site conditions warrant (See ***SDG*** 1.3.2). An Inorganic Zinc Coating System shall be used where site conditions preclude uncoated weathering steel. See the RFP for project specific requirements.

FDOT Explanation:

The Department is committed to weathering steel for new steel bridge structures. The use of coated steel bridges will be exclusively reserved for aesthetic purposes. Weathering Steel greatly reduces long-term maintenance expenses.

Structures Manual Volume 1: SDG

- **6 SUPERSTRUCTURE COMPONENTS**
  - ✓ **6.4.1.** **Deleted Paragraph B.**
  - ✓ **6.5.** **Added new Paragraph D and renumbered subsequent Paragraphs.**
  - ✓ **6.5.1.** **Revised Paragraph D.**
  - ✓ **6.5.2.** **Clarified the requirements of Paragraph A.3. Deleted Paragraph A.4.**
  - ✓ **6.5.3.** **Added provision for anchor rods to Paragraph A.2.**
  - ✓ **6.7.1.** **Changed cross reference in Paragraph C.1. Revised Paragraph C.3. Added Paragraph D.**
  - ✓ **6.7.2.** **Revised Paragraph C.1 to include ultimate loading behavior.**
  - ✓ **6.7.3.** **Revised Paragraph A.4. Deleted Paragraph A.5.**
  - ✓ **6.7.4.** **Revised Paragraph A.3. Added provision for anchor rods to Paragraph C.3.a. Changed "capacity" to "resistance" and added provisions for flat slabs to Paragraph D.**
  - ✓ **6.7.7.** **Changed Section title.**

Structures Manual Volume 1: SDG

- **6.5 BEARINGS (Rev. 01/13)**

  D. For cast-in-place flat slabs, use continuous unreinforced bearing strips having a minimum thickness of ¾".

FDOT Explanation:

The Department is setting the requirement for bearings under flat-slab bridges.

Structures Manual Volume 1: SDG

- **6.5 BEARINGS (Rev. 01/13)**
- **6.5.1 Design (Rev. 01/13)**

D. For elastomeric bearing pads, use the following criteria to establish bearing seat (pedestal) geometry and usage of beveled bearing plates considering beam grade, camber and skew effects.

1. For beam grades less than 0.5%, show bearing seats to be finished level and do not use beveled bearing plates.

2. For beam grades between 0.5% and 2%, show bearing seats to be finished parallel to the underside of the beam and do not use beveled bearing plates.

3. For beam grades greater than 2%, show bearing seats to be finished level and use beveled bearing plates.

4. Use transversely beveled or compound beveled bearing plates or bearing seats for all transversely sloped bearing conditions when the change in elevation across the width of the bearing pad is greater than or equal to 1/8 inch.

5. When possible, bearing seats at each end of the beam should have the same slope.

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- **6.5.1 Design (Rev. 01/13) – Cont'd**

6. When using FIBs with standard bearing pads which meet the requirements above, the beam end rotations due to beam camber (at 120 days) and deflection may be neglected if the combined effect is less than 0.0125 radians (1.25%).

FDOT Explanation:

The Department is setting the conditions when particular bearing seat and bearing plate combinations should be used. This information is also delivered on the Standard Index.

Structures Manual Volume 1: SDG

- **6.7 TRAFFIC RAILING [13.7]**
- **6.7.4 Existing Obsolete Traffic Railings (Rev. 01/13)**

A. General

3. When rehabilitation or renovation work is proposed on an existing structure with traffic railings that do not meet the criteria for new or existing railings as provided above, replace or retrofit the existing traffic railings to meet the crash-worthy criteria unless a Design Variation is approved. Refer to Chapter 23 of the PPM, Volume 1, for information about variations.

Modification for Non-Conventional Projects:
Delete ***SDG*** 6.7.4.A.2 and ***SDG*** 6.7.4.A.3 and see the RFP for requirements.

FDOT Explanation:

Simply stated, when a bridge is renovated or rehabilitated, it must be brought up to standards with respect to the safety railings, or a variation must be approved.

Structures Manual Volume 1: SDG

- **7 WIDENING AND REHABILITATION**
  - ✓ **7.** **Deleted Section 7.8 Repair or Strengthening Using Carbon Fiber Reinforced Polymers.**
  - ✓ **7.1.1.** **Revised Figure 7.1.1-1.**
  - ✓ **7.3.1.** **Replaced Paragraph C per SDB C12-02.**
  - ✓ **7.6.** **Added Paragraph H.**
- **8 MOVEABLE BRIDGES**
  - ✓ **8.** **Revised and reorganized entire Chapter.**
    - **Extensive Rework/Revision to Section 8. Please direct any specific questions to Mr. Angel Rodriguez, 850-414-4297**

Structures Manual Volume 1: SDG

- **7 WIDENING AND REHABILITATION (Rev. 01/13)**
- **7.6 WIDENING RULES (Rev. 01/13)**

Modification for Non-Conventional Projects:
Delete ***SDG*** 7.6.A and insert the following:
A. Do not mix concrete and steel beams in the same span. For existing bridges that are to be widened and that have insufficient vertical clearance, do not encroach on the existing vertical clearance unless otherwise allowed by the RFP.

FDOT Explanation:

Due to complications with the design and behavior of bridges with dissimilar material superstructure girders is the justification for the prohibition on the use of Steel and Concrete beams in the same span.

Structures Manual Volume 1: SDG

- **7 WIDENING AND REHABILITATION (Rev. 01/13)**
- **7.6 WIDENING RULES (Rev. 01/13)**

H. When widening an existing steel I-girder bridge adhere to the following requirements:

1. Provide concrete closure pour in deck between new and existing structure.
2. Provide diaphragms and cross-frames between new and existing girders, spaced to line up with existing diaphragms and cross-frames.
3. Attach cross-frame connection stiffeners to existing girder webs and flanges by angles or bent plates. Field drill and bolt to existing girders.
4. Field welding to existing girder webs, tension flanges, and flanges subject to stress reversal is prohibited.
5. Field welding to the compression flanges of existing girders is allowed, with approval of the SDO, but only if the compression flange is embedded in the concrete deck and bolted connections are not easily accommodated. Field welding must be performed by a certified welder in accordance with AWS D1.5. All field welding must be tested in accordance with AWS D1.5

Modification for Non-Conventional Projects:
Delete ***SDG*** 7.6.H.5 and see the RFP for requirements.

Structures Manual Volume 1: SDG

- **7.6 WIDENING RULES (Rev. 01/13) – Cont'd**

6. For major bridge widenings where the existing cross-frame connection plates are not connected to the flanges, the existing connection plates shall be retrofitted by attaching to the flanges by angles or bent plates as per the above procedures.

FDOT Explanation:

The Department seeks to provide standard widening details with Steel Bridge I-Girders and utilize proven techniques to facilitate the construction.

These standard design details provide for a consistent maintenance knowledge base on all steel I-girder structures that have been subsequently widened.

Structures Manual Volume 1: SDG

- **8 MOVABLE BRIDGES (Rev. 01/13)**
- **8.1 GENERAL**

On new movable bridge, movable bridge rehabilitation or movable bridge replacement projects, include a bridge plan "General Note" which requires the Contractor to assume full responsibility for the operation and maintenance of the movable bridge(s) throughout the duration of construction. Use the "Technical Special Provisions" issued by the SDO.

Modification for Non-Conventional Projects:
Delete ***SDG*** 8.1.1.A and associated Commentary and insert the following:
A. The design criteria of this chapter are applicable for new bridges and the electrical/ machinery design for rehabilitation of existing bridges. See the RFP for structural rehabilitation requirements.

Modification for Non-Conventional Projects:
Delete ***SDG*** 8.1.1.B and insert the following:
B. Provide bridge configurations that provide favorable life cycle cost benefits. Provide operational characteristics that minimize disruptions to the traveling public. Incorporate design and operational features that can be safely operated, and that can be easily maintained by Department forces.

Structures Manual Volume 1: SDG

- **8 MOVABLE BRIDGES (Rev. 01/13)**
- **8.1 GENERAL – Cont'd**

C. Design drive systems for new bascule bridges consisting of electric motors with gears. See SDG 8.1.2.

D. Do not design non-counterweighted or reduced counterweighted bascules. Design a concrete counterweight with drained pockets for counterweight blocks (concrete, cast-iron or steel). Do not design steel-slab counterweight systems unless encapsulated in concrete. (See SDG 8.6.3)

- **8.1.3 Trunnion Support Systems for New Bridges**

B. Design concrete trunnion columns; do not use steel trunnion towers.

FDOT Explanation:

Corrosion Environments around Bascule Bridges are infamously harsh on non-encapsulated ferrous metals.

Structures Manual Volume 1: SDG

- **8 MOVABLE BRIDGES (Rev. 01/13)**
- **8.1.5 Horizontal Clearance Requirements**

Design all movable bridges over navigable waterways to provide up to 110 ft. horizontal clearance as required by the United States Coast Guard (USCG) and the Army Corps of Engineers. Obtain permission from the SDO if clearances over 110 ft. between fenders are required.

Modification for Non-Conventional Projects:
Delete ***SDG*** 8.1.5 and see the RFP for requirements.

FDOT Explanation:

Do not expand horizontal clearances of Bascule Bridges beyond the 110ft requirement without SDO approval.

The RFP for a Design-Build Project can/may modify this requirement.

Structures Manual Volume 1: SDG

- **9 BDR COST ESTIMATING**
  - ✓ **9.** **Revised unit prices as noted.**
  - ✓ **9.1.** **Modified Section per SDB 12-07.**
  - ✓ **9.2.1.** **Deleted cost for Embedded Data Collectors.**
  - ✓ **9.3.1.** **Added new projects/prices.**
  - ✓ **9.3.5.** **Added new Section.**
- **10 PEDESTRIAN BRIDGES**
  - ✓ **10.6.** **Revised Paragraph D.**
  - ✓ **10.7.** **Deleted Paragraph D.5 and renumbered subsequent paragraph. Revised cross reference in Paragraph E.**
  - ✓ **10.11.** **Deleted Paragraph B and renumbered subsequent paragraph.**
  - ✓ **10.15.** **Deleted previous Section 10.15 "Fabricator Requirements" and renumbered subsequent Sections.**
- **11 TEMPORARY WORKS**
  - ✓ **11.** **Added new Chapter.**

Structures Manual Volume 1: SDG

- **9 BDR COST ESTIMATING (Rev. 01/13)**
- **9.1 GENERAL (Rev. 01/13)**

D. When prefabricated alternates are required to be investigated during the BDR phase per the feasibility questions and assessment matrix of PPM, Volume 1, Section 26.9.2.9, both direct costs (hard dollars) and indirect costs (soft dollars) are required to be reported for each alternate. An assessment matrix methodology allows for alternate selection based on less than perfect knowledge.

E. To date, the FDOT does not have sufficient historical bid data for prefabricated bridge alternates in order to develop reasonable cost estimates from average unit material costs. To fill this gap, the Structures Design Office has developed several training videos for the purpose of educating designers on factors for consideration related to use of Prefabricated Bridge Elements and Systems (PBES) for Accelerated Bridge Construction (ABC). Sample contractor estimates are provided to show how project costs may be developed to compare conventional construction methods versus a prefabricated ABC approach.

FDOT Explanation:

The Department is committed to the FHWA programs for Prefabricated Bridge Elements and Systems and the Accelerated Bridge Construction initiatives. This section further demonstrates that commitment and Consultants/Districts are encouraged to utilize innovated ideas to advance these initiatives.

Structures Manual Volume 1: SDG

- **10 PEDESTRIAN BRIDGES**
- **10.6 MATERIALS (Rev. 01/13)**

D. Contact the District Structures Design Engineer regarding whether to utilize unpainted weathering steel, galvanizing or a paint system. If a paint system is required, determine whether an Inorganic Zinc Coating System or a High Performance Coating System is preferred.

Modification for Non-Conventional Projects:
Delete ***SDG*** 10.6.D and see the RFP for requirements.

FDOT Explanation:

The Department recognizes the need to accommodate the District desires for aesthetics and material preferences – please be sure to coordinate with the District Project Manager on specific requirements for materials if not specifically detailed in the RFP or Contract Documents.

2013 Design Training Expo

Structures Manual Volume 1: SDG

- **11 TEMPORARY WORKS (Rev. 01/13)**

11.1 GENERAL This chapter is intended for use by Specialty Engineers, Contractor's Engineers of Record and Prequalified Specialty Engineers. For the design of all temporary works affecting public safety, the following provisions apply.

FDOT Explanation:

The key take-away is that this Section is for use by the Specialty Engineer, Contractor's Engineer and Prequalified Specialty Engineers. The Department recognized that provisions directly related to the Construction Specialty needed to be addressed in the Manual.

Shop Drawing Reviewers and CEI personnel need to be made aware of this section.

2013 Design Training Expo

Modifications To The 2013 Structures Manual VOL 2: The Structures Detailing Manual

Daniel L. Scheer, P.E.

Structures Manual Volume 2: SDM

- **I INTRODUCTION**
  - ✓ I.1. Clarified requirements of Paragraph B.
  - ✓ I.3. Relocated information to Structures Manual Introduction.
  - ✓ I.4. Revised Paragraphs C.
- **1 DRAFTING AND PRINTING REQUIREMENTS**
  - ✓ 1.2. Clarified requirements of Paragraph C.
- **2 DETAILING INSTRUCTIONS**
  - ✓ 2.10. Added Paragraph C.
  - ✓ 2.11.2. Clarified the requirements of Paragraph F.
- **3 COMPOSITION OF PLAN SET**
  - ✓ 3.7. Revised Paragraphs A, B and Paragraph D Commentary.
  - ✓ 3.8. Clarified requirements of Section.

Structures Manual Volume 2: SDM

- **I.4 QUANTITY CALCULATIONS (Rev. 01/13)**

  C. Show quantity breakdown by construction phase for individual components such as end bents, diaphragms, deck, traffic and pedestrian railings, expansion joints, bearings, reinforcing steel, riprap, slope pavement, etc. in the estimated quantity blocks located on corresponding plan detail sheets. For multiple adjacent bridges whether built in phases or at the same time, include quantities and quantity breakdowns with the individual bridge they are associated with. For adjacent bridges with continuous slope treatments or other similar features (e.g. median separated bridges), clearly indicate the quantity breakdowns for each bridge in the plans. Show quantity breakdowns on plan sheets to one additional decimal place of precision compared to that input into TRNS*PORT.

FDOT Explanation:

Account for each bridge individually, whether it is a parallel structure or similar structure – it is imperative to account for each independent structure.

Showing the quantity breakdown to one additional decimal place to the actual input of TRNS*PORT helps to minimize cumulative rounding errors in the record keeping.

Structures Manual Volume 2: SDM

- **2.10 STRENGTH AND CONTRAST OF LINES (Rev. 01/13)**

  C. When showing existing and proposed construction in the same view, show existing elements using dashed/dotted lines per CPCH.

FDOT Explanation:

Existing elements should be dashed/dotted so that they present a 'silhouetted' effect with the proposed solid lines.

Structures Manual Volume 2: SDM

- **2.11 DIMENSIONING**
- **2.11.2 Dimensions and Text (Rev. 01/13)**

F. Show dimensions in units of feet and inches. Show dimensions of 12-inches or more in feet, inches and fractions of an inch, and when the inch dimension is less than a full inch include the zero placeholder, e.g. 4'-0½". Show dimensions greater than 1-inch but less than 12-inches in inches and fractions of an inch. Show dimensions less than one inch in fractions of an inch without a leading zero, e.g. ¾". Some exceptions to this rule are component or member designations (i.e., 24" Square Piling, Existing 36" Steel Beam, etc.) and elevations.

FDOT Explanation:

Added 'examples' in the text to try and further clarify the intent with respect to the dimensioning detailing. FDOT still is having trouble receiving contract documents with consistent detailing practices.

Structures Manual Volume 2: SDM

- **4 CONCRETE COMPONENTS**
  - ✓ **4.3. Revised Figure 4.3-1.**
  - ✓ **4.3.4. Added provisions for anchor rods to Paragraph B.4.**
  - ✓ **4.3.10. Revised Paragraph D.**
  - ✓ **4.4. Modified Paragraph A per SDB C12-02.**
- **5 GENERAL NOTES AND BID ITEM NOTES**
  - ✓ **5.2. Deleted "July" and "C" from Paragraph A.1. Revised Paragraph B. Expanded requirements within table in Paragraph D.**
  - ✓ **5.3. Replaced Paragraph D.1 per SDB 12-12. Replaced Paragraph F per SDB C12-02.**
  - ✓ **5.4. Deleted Paragraph A and renumbered subsequent Paragraphs.**
- **6 SLOPE PROTECTION**
  - ✓ **6.1. Revised design aid details referenced in Paragraph B.**

Structures Manual Volume 2: SDM

- **5.2 TYPICAL GENERAL NOTES (Rev. 01/13)**

  D. Environment

Bridge Number	Superstructure	Substructure	
		Concrete	Steel
700XXX	Slightly	*	*
407XXX	Moderately	*	*
121XXX	Extremely	*	*

* List the environmental classification [Slightly, Mod., Extrem.] and controlling criteria (pH, Cl, SO_4, Resistivity).

FDOT Explanation:

The Department is asking the Criteria (pH, Cl, SO_4 & Resistivity) also be listed with the Classification.

Structures Manual Volume 2: SDM

- **7 PLAN AND ELEVATION**
  - ✓ **7 .** **Revised Plan and Elevation sheets in Structures Detailing Manual Examples.**
  - ✓ **7.3.** **Revised Paragraph I.**
  - ✓ **7.4.** **Revised Paragraph B.**
- **8 BRIDGE HYDRAULICS**
  - ✓ **8.1.** **Clarified requirements of Paragraph B.**
- **9 CONSTRUCTION SEQUENCE FOR BRIDGE WIDENING AND PHASED CONSTRUCTION**
  - ✓ **9.** **Revised Construction Sequence Example 3 in Structures Detailing Manual Examples.**
- **10 REPORT OF CORE BORINGS**
  - ✓ **10.2.** **Clarified requirements of Paragraph C.**

Structures Manual Volume 2: SDM

- **8.1 PURPOSE (Rev. 01/13)**

  B. This drawing is prepared by the Drainage Engineer of Record and should be included in the PD&E documents and/or must be in the 30% Plans submittal. This drawing must be included in the final bridge plans.

FDOT Explanation:

The Department has clarified that the Bridge Hydraulics Recommendation be produced by the Drainage Engineer of Record, and not the District Drainage Engineer.

Structures Manual Volume 2: SDM

- **11 FOUNDATION LAYOUT**
  - ✓ **11.2.** Revised Paragraph H.
  - ✓ **11.4.** Revised first Paragraph in Section. Revised Paragraph B.
- **12 SUBSTRUCTURE – BENTS**
  - ✓ **12.2.** Added provisions for anchor rods to Paragraphs M and S.
  - ✓ **12.5.** Relocated requirements of Paragraph D to SDG. Revised Paragraph G and added Commentary.
  - ✓ **12.6.** Revised Paragraph A.

Structures Manual Volume 2: SDM

- **11.2 FOUNDATION LAYOUT DRAWING (Rev. 01/13)**

H. All overhead and buried utilities and existing foundations in the vicinity and offset dimensions if applicable. Also indicate status of utilities, e.g. proposed, placed out of service, to be relocated, etc.

FDOT Explanation:

The Department is directing that the Designer denote the status of the Utility so the intent is clear to the Contractor and Utility Owners on the Contract Plans.

Structures Manual Volume 2: SDM

- **11.4 PILE DATA TABLE (Rev. 01/13)**

The pile data table cell is located in the Structures Bar Menu in CADD and is shown in Instructions for Design Standards (IDS) Index 20600. Complete this table and include it in the plans when using standard concrete piles as shown in the Design Standards and when using steel pipe or H piles. Do not add or delete columns within the Installation Criteria or Design Criteria sections of the table; if information in the column is not pertinent to the project, populate the data cell with "N/A". What follows is a column-by-column description of the information to be used when filling out the data table. For additional information, see SDG 3.5. See also, IDS 20600 when using standard prestressed concrete piles.

FDOT Explanation:

The Pile Data Table only needs to be completed for standard concrete piles, steel pipe piles and steel H-piles.

Structures Manual Volume 2: SDM

- **12.5 DESIGN CONSIDERATIONS - GENERAL (Rev. 01/13)**

G. Where bents are supported by drilled shafts without footings, place drilled shafts as follows:

1. Land Bents - set top of drilled shafts 1 foot below ground line.
2. Water Bents - set top of drilled shafts a minimum of 1 foot above normal or mean high water except for bridges over flood plains.
3. Floodplain Bents - set top of drilled shafts a minimum of 1 foot above the 100 year flood elevation and include an optional construction joint 1 foot below ground line. hen using standard prestressed concrete piles.

Commentary: The water elevation that will actually be present when the bridge is built cannot be determined during the design phase. By setting the top of drilled shaft elevation 1 foot above the 100 year flood elevation, the drilled shaft can be constructed with the water at any elevation below the 100 year flood elevation.

Conversely, if the top of drilled shaft elevation is set below the 100 year flood elevation and the water happens to be high during construction, a claim situation is potentially created.

Structures Manual Volume 2: SDM

- **12.5 DESIGN CONSIDERATIONS - GENERAL (Rev. 01/13) – Cont'd**

If the actual water elevation that is present during construction is below the 100 year flood elevation, the Contractor can potentially use the construction joint at the lower elevation to construct the drilled shaft without creating a claim situation or having to develop and get an alternate design approved.

FDOT Explanation:

The Department is trying to minimize claim situations while simultaneously offering the Contractor 'options' to facilitate a more competitive bid situation.

Structures Manual Volume 2: SDM

- **12.6 DESIGN CONSIDERATIONS – END BENT (Rev. 01/13)**

  A. When calculating elevations, allow for a minimum of 2" and a maximum of 4" of clearance between the top of cheekwall and bottom of deck slab.

FDOT Explanation:

The Department added the Maximum Dimension of 4" to prevent vermin from using the gap as a nest or sanctuary.

Structures Manual Volume 2: SDM

- **13 SUBSTRUCTURE – PIERS**
  - ✓ **13.2.** Added provisions for anchor rods to Paragraphs I, J and K.
  - ✓ **13.7 .** Added provisions for anchor rods in Paragraph O and Figures 13.7-4, 13.7-5 and 13.7-6.
  - ✓ **13.8.** Revised Paragraph B.
  - ✓ **13.10.** Revised cross references in Figure 13.10-1. Revised Paragraph E.3.
  - ✓ **13.11.** Added Paragraph D.3.
  - ✓ **13.12.** Revised Paragraph A.
  - ✓ **13.13.** Added provisions for anchor rods to Paragraph B.
- **14 FINISH GRADE ELEVATIONS**
  - ✓ **14.1.** Revised Paragraph B.
  - ✓ **14.2.** Added Paragraph A.4.

Structures Manual Volume 2: SDM

- **13.8 PIER DESIGN CONSIDERATIONS - PIER AESTHETICS (Rev. 01/13)**

  B. The use of cheekwalls on pier caps **is required** at locations where two beam or girder types of different shapes, heights or dissimilar materials are to be used on adjacent spans. A curved bridge supported by straight beams is another location where pier cap cheekwalls can economically enhance a bridge's aesthetics. Cheekwalls on skewed bridges should be parallel to the skew, not normal to the pier cap. The inside face of pier cap cheek walls should be poured close to the exterior beam to prevent shadowing. Provide sufficient clearance between the cheekwall and the exterior beam to allow for jacking of the span and bearing replacement. See Figure 13.8-1.

FDOT Explanation:

The Department made the use of cheekwalls on pier caps where two beams or girder types of different shapes, heights or dissimilar materials are to be used on adjacent spans a REQUIREMENT – this is no longer 'encouraged'.

Structures Manual Volume 2: SDM

- **13.11 PIER DESIGN CONSIDERATIONS - STRADDLE PIERS (Rev. 01/13)**

  D. For rigidly framed concrete straddle piers:

  3. For post-tensioned straddle piers, account for secondary moments, elastic shortening and time dependant effects in the analysis of the framed pier.

FDOT Explanation:

The Department wants to ensure Designers account for all structural effects due to the use of post-tensioning. GUIDELINES LANGUAGE – YES… Will be moved in the next edition.

Structures Manual Volume 2: SDM

- **14.2 ACCURACY (Rev. 01/13)**

  Finish grade elevations are riding surface elevations (top of slab) on the bridge.To ensure accuracy, adhere to the following guidelines:

  A. Space T-lines based on which of the following conditions governs:

  1. Such that a linear interpolation midway between elevations does not deviate from the theoretical elevation by more than 0.005'.

  2. No less than three equal spaces within any given span.

  3. Not more than 10 feet between T-lines within any given span.

  4. Special case for bridges on flat (0.0%) grades: Provide a single T-line at centerline span. Additional T-lines are not required or warranted.

FDOT Explanation:

The Department recognizes that for flat grade bridges, multiple station deck elevations are not necessary.

Structures Manual Volume 2: SDM

- **15 SUPERSTRUCTURE – CONCRETE ELEMENTS**
  - ✓ **15.2.** **Revised Paragraph G. Deleted Paragraph K and renumbered subsequent Paragraphs.**
  - ✓ **15.5.** **Revised Paragraph H. Added Paragraphs I and J.**
- **16 STRUCTURAL STEEL GIRDERS**
  - ✓ **16.5.** **Clarified the requirements of the first Paragraph of the Section.**
  - ✓ **16.6.** **Revised Figures 16.6-3 and 16.6-4 and added Figure 16.6-5.**
  - ✓ **16.10.** **Revised Paragraph C. Added Paragraph D and renumbered subsequent Paragraph.**
  - ✓ **16.11.** **Added provisions for anchor rods to Paragraph B. Revised Paragraph G.**
  - ✓ **16.12.** **Added new Section per SDB C12-02.**

Structures Manual Volume 2: SDM

- **16.10 WELDS (Rev. 01/13)**

  C. Where avoidable, do not use Category E weld types as defined in LRFD Table 6.6.1.2.3-1. Category E welds are allowed for use in cross frame connections.

FDOT Explanation:

The Department specifically allows for Category E welds on cross frame connections.

Structures Manual Volume 2: SDM

- **16.12 SPECIAL DETAILS FOR UNCOATED WEATHERING STEEL BRIDGES (Rev. 01/13)**

  The following details are required for uncoated weathering steel bridges to prevent corrosion of the girders and staining of the substructure elements due to runoff. See Figure 16.12-1, Figure 16.12-2 and Figure 16.12-3.

  A. Provide Drip Tabs on the bottom flange of all box-girders and I-Girders up grade from each pier/bent to divert runoff water.

  B. Provide Drip Strips along the outside edge of exterior I-girders to channel runoff water past pier/bents or to pier/bent troughs adjacent to girder ends.

  C. Slope the caps at all end bents and at piers located at intermediate deck joints. Provide troughs or other means to drain water from the cap to an embedded pipe drain.

  D. Provide a ½" thick sacrificial end plate at the ends of all I-girders to protect girders from leaky joints.

  E. Use sealed expansion joints. Avoid any type of open joint that allows runoff to reach the steel.

  F. Provide details that take advantage of natural drainage. Eliminate details that retain water, dirt, and other debris.

Structures Manual Volume 2: SDM

- **18 ADA REQUIREMENTS**
  - ✓ 18.2. Revised Figures 18.2-1 and 18.2-2.
  - ✓ 18.5. Revised Figure 18.5-1. Deleted Figures 18.5-2 and 18.5-3.
- **19 RETAINING WALLS**
  - ✓ 19.5.1. Revised Paragraph A.
  - ✓ 19.5.2. Revised Paragraph A.
  - ✓ 19.6.1. Revised first Paragraph of Section. Revised Figure 19.6.1-2.
  - ✓ 19.8. Clarified the requirements of the Section.
- **20 SEGMENTAL BRIDGES**
  - ✓ 20.1. Revised Paragraph D.6.
  - ✓ 20.3. Revised Paragraphs A.1 and A.2.

FDOT Explanation:

Only minor 'verbiage' modifications on these Sections.

2013 Design Training Expo

Structures Manual Volume 2: SDM

- **21 MOVEABLE BRIDGES**
  - ✓ 21.12. Changed "barrier" to "railing" throughout section.
- **22 DRAINAGE**
  - ✓ 22.2. Revised Paragraphs C and G.
  - ✓ 22.3. Added provisions for hangers to Paragraph A. Added provisions for anchor rods to Paragraph B.

2013 Design Training Expo

Structures Manual Volume 2: SDM

- **22.2 Deck Drains (Rev. 01/13)**

  C. Scuppers must not discharge directly on the supporting beams or girders, **unprotected** substructure embankments at end bents, **substructure embankments at end bents protected by slope pavement or sand cement riprap**, lower roadways, sidewalks, railroads, or other areas (water or land) where not permitted.

FDOT Explanation:

The Department added additional, specific detail, to the requirements.

Structures Manual Volume 2: SDM

- **22.3 Drain Conveyance (Rev. 01/13)**

  A. Fully detail pipe hanger or other attachments to the structure in accordance with SDG 1.9. Use roller-type hangers for attaching pipes to bridges with non-conductive type rollers. **Specify hot dip galvanized hangers** for all attachments to the bridge structure where the superstructure environment has been classified as slightly or moderately aggressive. Specify 316 stainless steel hangers for all attachments to the bridge structure where the superstructure environment has been classified as extremely aggressive and other locations as directed by the District.

FDOT Explanation:

The Department changed the material requirements for hangers from Stainless Steel to Hot Dipped Galvanized for slightly or moderately aggressive environments. Stainless Steel requirement is maintained for extremely aggressive environments.

2013 Structures Design Bulletins

Daniel L. Scheer, P.E.

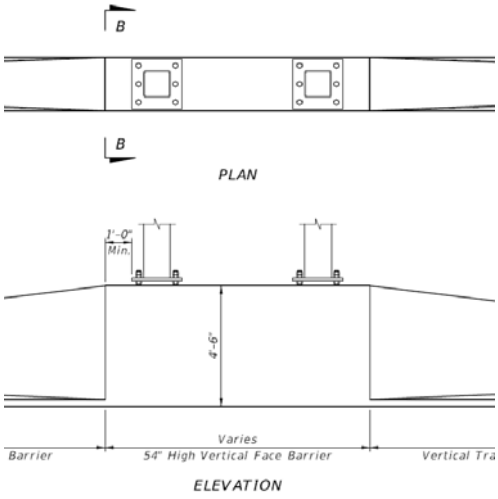
Structures Design Bulletins

- SDBs are mandatory, supersede the current Structures Manual, and will be issued when the State Structures Design Engineer (SSDE) deems a change essential to production or structural integrity issues and in need of immediate implementation. SDBs may address issues in plans production, safety, structural design methodology, critical code changes, or new specification requirements.
- SDBs that significantly affect other offices must be composed with the assistance of the affected office. SDBs that significantly affect construction will be issued as a Joint Bulletin with the State Construction Office (coordinate with the State Construction Office on the proper Construction Bulletin number).

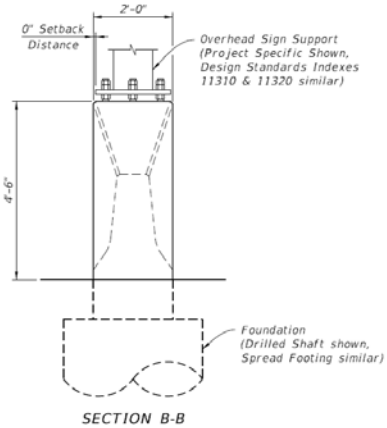
Structures Design Bulletin 13-01

- **Median Barrier Mounted Overhead Sign Structures**
  - ✓ This bulletin revises and expands on the Department's policy for attachment of overhead sign structures to concrete median barrier walls and revises ***Design Standards Index 410.***
  - ✓ Do not utilize median barrier mounted overhead sign structures unless there is no other practical or economical alternative.
- These criteria are intended to improve crashworthiness of median barrier walls and the sign support structures that are attached to them while still meeting minimum standards for roadway signing. Steel is the required material for the sign support structures because it is more ductile and durable than other materials such as aluminum and thus is less likely to break completely away when impacted by an errant vehicle.

Structures Design Bulletin 13-01

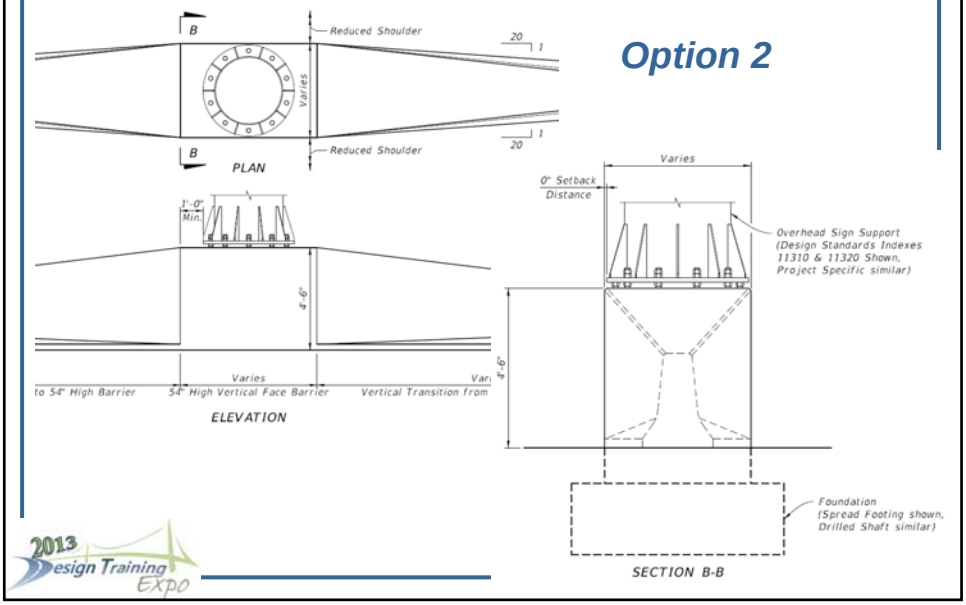


Option 1



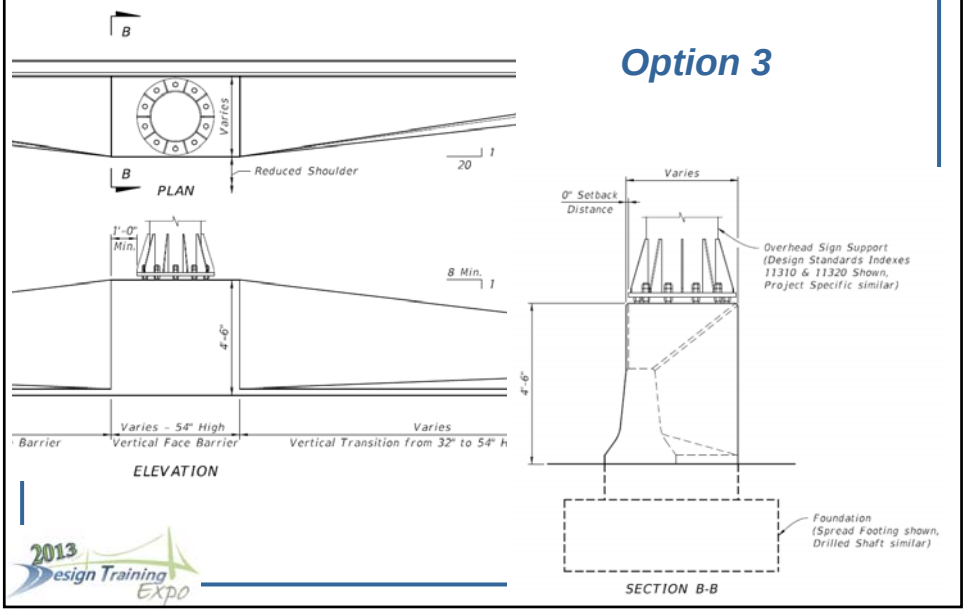
Structures Design Bulletin 13-01

Option 2



Structures Design Bulletin 13-01

Option 3



Structures Design Bulletin 13-02

- **Direction to Design-Build and Public-Private-Partnership Project Phase Reviewers // Modifications to the Electronic Review Comment System (ERC)**
  - ✓ Separate component plan review comments into categories which consist of comments that **do** and comments that **do not** refer to direct violations of the Contract.
- Design-Build component plan reviewers should primarily review Design-Build and Public-Private-Partnership project plan submittals for compliance with contract requirements. It is acknowledged that non-contractual comments submitted 'for information only' can also provide valuable feedback to the Design-Build Firm or Concessionaire.
- Historically, comments vary greatly depending on the reviewer, discipline, district and office. The new ERC System is an attempt to distinguish/separate comments related to contractual requirements from non-contractual requirements. **ONLY CONTRACTUAL REQUIREMENTS WILL REQUIRE A RESPONE FROM THE D/B or P3 FIRM.**

Structures Design Bulletin 13-03

- **Concrete Surface Finish Requirements**
  - ✓ This bulletin revises and expands on the Department's policy for the use of concrete surface finishes on bridges, retaining walls, noise walls and roadway barriers.
- In the past, the use of Class 5 coatings has been to coat most concrete surfaces without exception. In this new policy, the opposite practice is being implemented, i.e. no Class 5 coating will be used unless it is approved by an officially authorized Department Engineer.
- The intent is to reduce construction costs and present a more uniform aesthetic appearance of the structure during its entire service life.
  - ✓ Creates a NEW Section in the ***Structural Design Guidelines***, Section 1.4.
  - ✓ Replaces a Section in the ***Structural Design Guidelines***, Section 7.3.1.C.
  - ✓ Replaces a Section in the ***Structural Detailing Manual***, Section 4.4.

Structures Design Bulletin 13-03

- NEW ***Structural Design Guidelines*** Section 1.4.
  - ✓ The use of smooth uncoated surfaces is preferred for all concrete elements.
  - ✓ Textures, striations and/or graphics that are compliant with Department requirements may be used.
  - ✓ Class 5 coatings, tints or stains may be used on noise walls, bridges and retaining walls that require enhanced aesthetic treatments.
    - Approval by the Chief Engineer is required for the use of coatings, tints or stains on all noise walls in rural locations and on all structures not specifically listed above.
  - ✓ Class 5 coatings, tints or stains may be used only on the outside of concrete traffic railings and parapets mounted on bridges and retaining walls.
    - Approval by the Chief Engineer is required for Class 5 coatings, tints or stains on median traffic railings and the inside & top surfaces of outside shoulder railings and parapets mounted on bridges and retaining walls.
  - ✓ If a Local Agency desires a bridge, retaining wall or noise wall with coatings not otherwise qualified by the Department, the structure may be treated with approval by the District Secretary. The Local Agency shall provide the additional construction funding for the coatings, tints or stains and shall commit to cover the associated maintenance costs for the service life of the structure.

Structures Design Bulletin 13-03

- NEW ***Structural Design Guidelines*** Section 7.3.1.C.
  - ✓ When widening an existing bridge that does not have an existing Class 5 coating, follow the requirements of SDG 1.4.5.
  - ✓ When widening a bridge that has an existing Class 5 coating, coat the new portions of the bridge with Class 5 coating in accordance with SDG 1.4.5 or remove the existing Class 5 coating from the existing portion of the bridge as appropriate.
- NEW ***Structural Detailing Manual*** Section 4.4.
  - ✓ Show the limits of the areas to be coated in the plans.
    - For bridges and retaining walls with Class 5 coatings, show appropriate "Class 5 Applied Finish Coating" notes in the General Notes and the corresponding Surface Finish Details on the General Notes drawing.
    - For noise walls, see the Instructions for Design Standards Index 5200. Do not use generic or brand names for colors.
  - ✓ Show the limits of the anti-graffiti coating areas to be coated in the plans. Specify the type of anti-graffiti coating to be used in the plans, e.g. sacrificial or non-sacrificial.

Structures Design Bulletin 13-04

- **Superstructure Continuity Requirements for Bridges Subject to Vessel Impact Forces**
  - ✓ This bulletin modifies the Department's design policy regarding superstructure continuity for multi-span bridges subject to vessel impact forces to allow for concrete girder bridges made continuous for live load only.
- In the past, bridges subject to vessel impact (greater than 1,500 kips) were limited to 3-span continuous steel, minimum 3-span segmental, or minimum 3-span post-tensioned spliced concrete beam bridges.
- This new policy allows for the addition of precast concrete simple beam bridges made continuous for live load in these situations. The restriction for requiring other structures to be discontinuous for live load assures ease of repair in case of damage.
  - ✓ Delete & Replace ***Structural Design Guidelines***, Section 2.11.7.
  - ✓ Delete & Replace ***Structural Design Guidelines***, Section 4.1.7.

Structures Design Bulletin 13-05

- **Criteria for the Use of Drainage and Utility Conveyances near Earth Retaining Structures**
  - ✓ This bulletin replaces the Department's Structures Design Guidelines, Section 3.13.1 regarding the use of drainage and utility conveyances near earth retaining structures.
- To prevent issues related to water influx and soil migration to avoid wall instability and/or structural distress of the wall, supported structures and/or roadways.
- The requirements are intended to protect walls and the traffic or other structures and roadways that would be directly affected by their subsidence, shifting or other forms of compromise.
  - ✓ Delete & Replace ***Structural Design Guidelines***, Section 3.13.1.

Structures Design Bulletin 13-05

- **Criteria for the Use of Drainage and Utility Conveyances near Earth Retaining Structures**

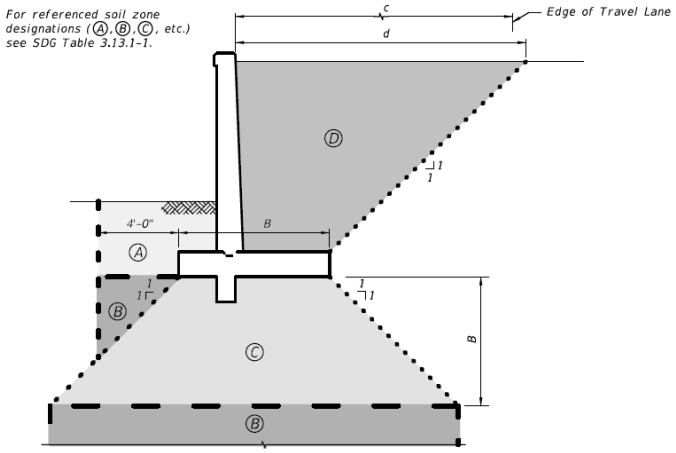
Table 3.13.1-1 Soil Zone Criteria

Soil Zone	Requirements [1]
A	Longitudinal and transverse conveyances must be separately encased or wrapped with filter fabric.
B	Longitudinal and transverse conveyances must be separately encased.
C	No longitudinal conveyances allowed. Transverse conveyances must be separately encased.
D	If c < d, longitudinal and transverse conveyances must be separately encased.
E	No longitudinal conveyances allowed. Transverse conveyances must be separately encased or wrapped with filter fabric.
F	Longitudinal conveyances must be separately encased. Transverse conveyances must be separately encased or wrapped with filter fabric.
G	No longitudinal or transverse conveyances allowed.
H	For conveyances to be placed within or below the reinforced soil mass, consider future maintenance and access requirements through reinforcement that will remain in place.
I	Longitudinal conveyances outside traffic lanes must be separately encased. No longitudinal or transverse conveyances below traffic lanes.

1. Requirements apply to walls designed and constructed using a Design Standard as shown, similar non-standardized wall designs and to other wall types as listed.

Structures Design Bulletin 13-05

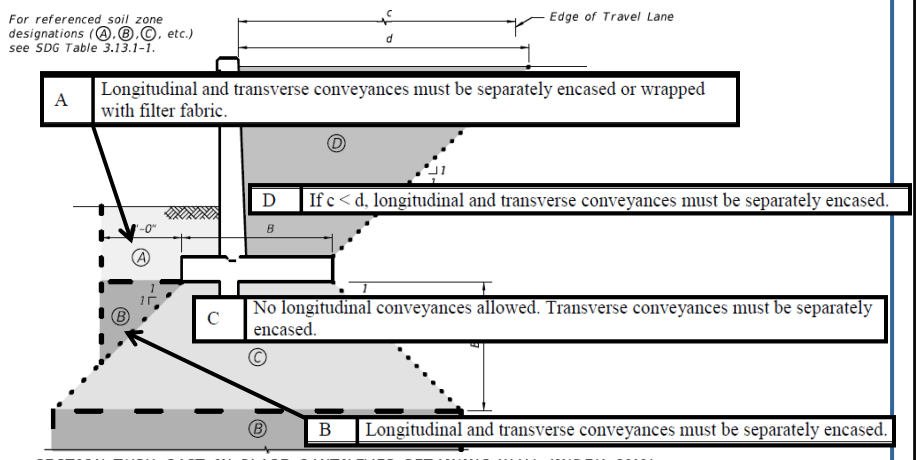
- **Criteria for the Use of Drainage and Utility Conveyances near Earth Retaining Structures**



SECTION THRU CAST IN PLACE CANTILEVER RETAINING WALL (INDEX 6010)

Structures Design Bulletin 13-05

- **Criteria for the Use of Drainage and Utility Conveyances near Earth Retaining Structures**



SECTION THRU CAST IN PLACE CANTILEVER RETAINING WALL (INDEX 6010)

Structures Design Bulletin 13-06

- **Spread Footing Abutments on MSE Walls and MSE Walls Below the Design High Water Elevation**
  - ✓ This bulletin updates the Department's Specifications for special compaction requirements for the backfill supporting spread footing abutments.
- The Specifications are also being updated to require the use of coarse aggregate on permanent walls for the portion of the reinforced backfill between the leveling pad and the elevation one foot above Design High Water.
  - ✓ Delete & Replace ***Structural Design Guidelines***, Section 3.13.2.N.
  - ✓ Insert into ***Structural Design Guidelines***, Section 3.13.2.P
  - ✓ Insert into ***Structural Detailing Manual***, Section 19.1.

Structures Design Bulletin 13-06

- **Spread Footing Abutments on MSE Walls and MSE Walls Below the Design High Water Elevation**
  - ✓ This bulletin updates the Department's Specifications for special compaction requirements for the backfill supporting spread footing abutments.
- The Specifications are also being updated to require the use of coarse aggregate on permanent walls for the portion of the reinforced backfill between the leveling pad and the elevation one foot above Design High Water.
  - ✓ Delete & Replace ***Structural Design Guidelines***, Section 3.13.2.N.
  - ✓ Insert into ***Structural Design Guidelines***, Section 3.13.2.P
  - ✓ Insert into ***Structural Detailing Manual***, Section 19.1.

Structures Design Bulletin 13-07

- **Spliced Pretensioned/Post-Tensioned U-Girders**
  - ✓ This Structures Design Bulletin introduces requirements for the design and detailing of Spliced Pretensioned/Post-Tensioned U-Girder bridges. This bulletin also includes other changes to the Structures Design Guidelines that are necessary to differentiate between Spliced Pretensioned/Post-Tensioned U-girder bridges and other superstructure types.
- Per **LRFD 5.14.1.3-1**, spliced U-girders are not to be considered as segmental construction for the purposes of design. However, due to the inherent complexity involved in designing spliced U-girder bridges, per the Implementation Plan, designers shall be qualified for work type 4.2.3 Major Bridge Design-Segmental. Update and Expand various Sections of Structural Design Guidelines, Section 4.
  - ✓ Delete & Replace ***Structural Design Guidelines***, Section 6.8.
  - ✓ Delete & Replace ***Structures Detailing Manual***, Section 22.3.H.

Structures Design Bulletin 13-07

- **Spliced Pretensioned/Post-Tensioned U-Girders**
- **Extensive coordination with SDO will be required for initial projects.**
- Construction of spliced U-girder bridges includes pre-casting either straight or curved sections, supporting the sections using temporary supports as required and splicing the sections together using post-tensioning. For curved structures, a lid slab is cast after the girder segments are erected and before the continuity post-tensioning is applied to increase the torsional resistance of the section. After the section is closed and stressed, forms are placed between the boxes and a full depth deck is cast.
- Advantages to this type of construction compared to conventional construction include: .
  - ✓ Lower fabrication times.
  - ✓ Faster construction.
  - ✓ Ability to span longer distances
  - ✓ Increased aesthetics by providing a unified appearance.

Structures Design Bulletin 13-07

- **Spliced Pretensioned/Post-Tensioned U-Girders**
- This bridge type is available for consideration on all projects immediately and its implementation and use is at the discretion of the District.
- The Structures Design Office has taken the initiative to increase the inventory of constructible, standard, reliable and innovative bridge solutions. The Department expects to see more cost-effective designs that will not sacrifice the aesthetics or infrastructure quality that is realized by the traveling public.
- Spliced girder bridges are typically used for continuous structures in order to facilitate longer spans.
- The U-girder section will eventually be a standardized shape and will offer a competitive solution to steel box girders and concrete segmental bridges where previously no alternative was available.

Structures Design Bulletin 13-08

- **Top Slab Tendons Across Mid-Span Closure Pours in Balanaced Cantilever Segmental Bridges**
  - ✓ This Structures Design Bulletin address the absence of a sufficient number of tendons across the top slab closure pour and the resulting lack of compression has been identified as contributing to in-service performance issues with closure pours in balanced cantilever spans.
  - ✓ Delete & Replace ***Structural Design Guidelines***, Table 4.5.5-3.
  - ✓ Add ***Structures Design Guidelines***, Section 4.5.5(K).

Structures Design Bulletin 13-08

- **Top Slab Tendons Across Mid-Span Closure Pours in Balanaced Cantilever Segmental Bridges**

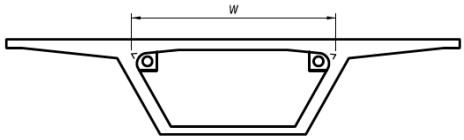
Table 4.5.5-4 Minimum Number, Size and Anchor Location of Top Slab Tendons Across Mid Span Closure Pours

Web Spacing per cell - see Figure 4.5.5-1	Number and size of Tendons per cell [1]	Tendon Anchor Locations referenced from adjacent face of Closure Pour [2]
W ≤ 12 ft	Two tendons - 4-0.6" diameter	One adjacent to each web anchored in 2nd Segment back
12 ft < W ≤ 20 ft	Two tendons - 4-0.6" diameter	One adjacent to each web anchored in 3rd Segment back
20 ft < W ≤ 25 ft	Two tendons - 7-0.6" diameter	One adjacent to each web anchored in 3rd Segment back
25 ft < W ≤ 30 ft	Three tendons - 7-0.6" diameter	One adjacent to each web anchored in 2nd Segment back and one at middle of cell anchored in 3rd Segment back
W > 30 ft	Four tendons - 7-0.6" diameter	One adjacent to each web anchored in 3rd Segment back and two evenly spaced across cell anchored in 4th Segment back

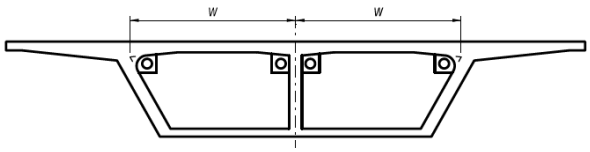
1. Alternate strand or PT bar tendon configurations which provide an equivalent force may be substituted for tendon configurations shown.
2. The resulting distance from tendon anchor location to adjacent face of closure pour is the minimum. Locate top slab tendon anchors longitudinally so that the tendons overlap a minimum of one pair of cantilever tendons.

Structures Design Bulletin 13-08

- **Top Slab Tendons Across Mid-Span Closure Pours in Balanaced Cantilever Segmental Bridges**
  - ✓ *Commentary: This is a minimum requirement and is not to be added to those required by the longitudinal analysis, i.e. if the number and size of top slab tendons across closure pours required by the longitudinal analysis exceeds these minimums, no additional tendons are required.*



SINGLE CELL BOX GIRDER
(Two Tendons Shown, Three and Four Tendons Similar)



MULTI CELL BOX GIRDER
(Two Cell Box Shown, Three or More Cell Boxes Similar)
(Two Tendons Per Cell Shown, Three and Four Tendons Per Cell Similar)

2013 Structures Design Manual UPDATES

QUESTIONS

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