



## Florida Department of Transportation

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November 1, 2016

### MEMORANDUM

**TO:** All Users of the Florida Department of Transportation *Structures Manual*

**FROM:** Robert Robertson, State Structures Design Engineer

**COPIES:** Brian Blanchard, Assistant Secretary for Engineering and Operations; Courtney Drummond, Chief Engineer; Tim Lattner, Director, Office of Design; Assistant State Structures Design Engineers (Thomas Andres, Andre Pavlov, Sam Fallaha, Charles Boyd and Will Potter); Larry Jones, State Geotechnical Engineer; Jeffrey Pouliotte, State Structures Maintenance Engineer; District Structures Design Engineers (Andra Diggs, Rod Nelson, Keith Shores, Ramón Otero, Neil Kenis, Hailing Zhang, Gautom Dey and Russ Snyder); District Structures Maintenance Engineers (James Jacobsen, Keith Campbell, Marshall Hagler, Thomas Reynolds, Ed Kestory, Dennis Fernandez and Aran Lessard); Jeffrey Ger, FHWA

**SUBJECT:** January 2017 *Structures Manual* (625-020-018)

The Florida Department of Transportation Structures Design Office has officially released the January 2017 *Structures Manual* with an effective date of January 1, 2017. The *Structures Manual* can be found on the Structures Design Office website at:

<http://www.fdot.gov/Structures/StructuresManual/CurrentRelease/StructuresManual.shtm>

The *Structures Manual* is provided in PDF format and includes hyperlinks, bookmarks and search capabilities. The *Structures Manual* can be viewed online or it can be installed on your computer. To install the *Structures Manual* on your computer, click on the FDOT icon at the above website and follow the prompts to complete the installation. An icon (red for 2017) will be added to your Desktop, which you may then click to launch the *Structures Manual*. If you already have a previous edition of the *Structures Manual* installed on your computer, installation of the 2017 *Structures Manual* will not overwrite it.

The *Structures Manual*, updated every January, is the primary source for FDOT structural design criteria. The design criteria found in the *Structures Manual* shall be incorporated on all future projects and on those projects currently being developed (i.e., when design and detailing have not already reached final stages). Submit design exceptions or variations in accordance with Chapter 23 of the *Plans Preparation Manual, Volume 1*.

For questions about the *Structures Manual*, or its application to a particular project, contact the appropriate District Structures Design Office.

To improve or further develop the **Structures Manual**, submit suggestions to Charles Boyd, Florida Department of Transportation, 605 Suwannee Street, MS 33, Tallahassee, Florida 32399-0450. ([e-mail charles.boyd@dot.state.fl.us](mailto:charles.boyd@dot.state.fl.us)).

## **Structures Manual January 2017 Revisions**

### **Structures Manual Introduction**

Updated links from “www.dot.state.fl.us” to “www.fdot.gov” throughout the Manual.

- I.2 ..... Updated title of Volume 3.
- I.3 ..... Corrected reference to Florida Statutes.
- I.6 ..... Updated references in Paragraphs B.5 and B.7.
- I.10.3 ..... Corrected reference to Florida Statutes in Paragraph D.

### **Volume 1 – Structures Design Guidelines**

- I.3 ..... Added and Revised Wind Load cross references in Table I.3-1 to coordinate with changes to SDG Chapter 2.
- 1.1.3 ..... Added new Paragraph A.4 and new Figure 1.1.3-1.
- 1.2 ..... Clarified requirements of Paragraph C.
- 1.4.1 ..... Added ASTM A276 to deformed stainless steel bar and clarified requirements for use of ASTM A1035 steel in Paragraph B; Clarified requirements in MNCP Box in Paragraph D.
- 1.4.2 ..... Revised cover requirements for traffic railings in Table 1.4.2-1 per SDB 16-06.
- 1.6.2 ..... Revised Paragraph D.2 Commentary #6 per SDB 16-06 with subsequent modifications.
- 1.6.3 ..... Revised ACI reference in Paragraph B.5.
- 1.9 ..... Clarified that clicking the text link or new image link will open the referenced Appendix 1A; Revised Figure 1.9-1 to show single-slope traffic railings.
- 1.11.1 ..... Revised Paragraph B and added Table 1.11.1-1 per SDB 16-07 with subsequent modifications; Added Figure 1.11.1-1 and Table 1.11.1-2; Revised Paragraphs C and D and associated MNCP box; Revised Paragraph F.
- 1.11.2 ..... Revised Paragraphs A.1, B and H.
- 1.11.3 ..... Combined and revised design values for wobble coefficient and coefficient of friction in Paragraph D; Deleted Paragraph E.
- 1.11.4 ..... Revised Section per SDB 16-07 with subsequent modifications.
- 1.11.5 ..... Revised Paragraphs A, B and C per SDB 16-07.
- 1.11.7 ..... Revised Paragraphs C and E.
- 2.2 ..... Added Single-Slope Traffic Railing values to Table 2.2-1 per SDB 16-06.

- 2.4 ..... Revised Section.
- 2.6.2 ..... Added Paragraph D.
- 2.8.2 ..... Added cross reference to LRFD 4.6.3.
- 3.1 ..... Clarified stirrup clearance requirements in Paragraph F.2; Clarified requirements of Table 3.1-1; Deleted corrosion rates for anchored sheet pile walls note in Design Life section of Table 3.1-1 Commentary.
- 3.5.1 ..... Clarified applicability of Footnote 3 in Table 3.5.1-1.
- 3.5.6 ..... Corrected LRFD cross reference; Revised Testing Requirements in Table 3.5.6-1.
- 3.5.14 ..... Added cross references to Design Standards Index 22600 in Paragraphs A and B.
- 3.6.1 ..... Clarified requirements for miscellaneous structures.
- 3.10 ..... Revised Paragraph A.
- 3.11.1 ..... Revised Paragraph H and Table 3.11.1-2 and added Figures 3.11.1-1 and 3.11.1-2 per SDB 16-07.
- 3.11.4 ..... Added Paragraph C per SDB 16-05.
- 3.12 ..... Revised Figure 3.12-1 to show single-slope traffic railings.
- 3.12.1 ..... Clarified the requirements of Paragraph H.
- 3.12.6 ..... Clarified the requirements of first Paragraph; Deleted second Paragraph.
- 3.13.2 ..... Revised Paragraph C requirements for leveling pads to allow compacted aggregate leveling pad for permanent walls with block facing; Updated PPM cross reference in Figure 3.13.2-2.
- 3.14.2 ..... Clarified Paragraph C.
- 3.14.3 ..... Clarified the fender system height requirement in Paragraph B.
- 3.15.6 ..... Clarified minimum thickness requirement considerations in Paragraph A.
- 3.16.4 ..... Revised Section.
- 3.18.4 ..... Revised Section.
- 4.1.4 ..... Added Paragraphs B, C and Figure 4.1.4-1 per SDB 16-05.
- 4.1.8 ..... Numbered first Paragraph as Paragraph A and added new Paragraph B and Commentary.
- 4.2.5 ..... Added values for Single-Slope Traffic Railings to Table 4.2.5-1 and 4.2.5-2 per SDB 16-06; Revised Minimum  $A_3$  value for 32" Vertical Face Traffic Railing in Table 4.2.5-1.
- 4.2.10 ..... Clarified requirements of Paragraph D.
- 4.2.12 ..... Revised Figure 4.2.12-1 to show single-slope traffic railings.
- 4.3.1 ..... Revised Paragraph E per SDB 16-01.
- 4.3.4 ..... Revised wind speeds, beam length requirement, and Eq. 4-1.

- 4.4.1 .....Added new Paragraphs C and D per SDB 16-07.
- 4.4.3 .....Revised Paragraph A and associated MNCP box per SDB 16-01.
- 4.5.1 .....Revised Table 4.5.1-1.
- 4.5.2 .....Revised Table 4.5.2-1 per SDB 16-07.
- 4.5.3 .....Revised first Paragraph and Table 4.5.3-1 and added Figures 4.5.3-1, 4.5.3-2 and 4.5.3-3 per SDB 16-07.
- 4.6.2 .....Revised Paragraphs C.1.c, C.2.a, C.2.b and D.2.
- 4.6.3 .....Revised Paragraph A; Added new Figure 4.6.3-2 and renumbered subsequent Figure.
- 4.6.4 .....Added new Paragraph F per SDB 16-07; Revised Figure 4.6.4-2.
- 4.6.7 .....Revised Figure 4.6.7-1.
- 4.7 .....Added new Paragraph D per SDB 16-07.
- 4.8 .....Added new Paragraph B per SDB 16-07.
- 5.1 .....Revised Paragraphs A and B.
- 5.3.2 .....Added new Paragraph A.4; Clarified requirements of Paragraph C.
- 5.4 .....Revised ASTM reference in Paragraphs A and B.
- 5.12.2 .....Revised reference "ASTM A325" to "ASTM F3125 Grade A325" bolts.
- 6.4.1 .....Corrected reference to Specifications in Paragraph C.
- 6.5 .....Revised Paragraph D per SDB 16-01.
- 6.5.1 .....Removed reference to deleted Index 20500 in Paragraph C; Revised Paragraph D.4.
- 6.7.1 .....Revised Paragraphs A.1, A.2 and A.3 to require MASH testing for projects let after 7/1/18; Revised Paragraph B per SDB 16-06; Added new Paragraph F.
- 6.7.3 .....Replaced Section and provided link to FHWA website for policy requirements.
- 6.7.4 .....Revised Paragraph B.
- 6.7.9 .....Corrected LRFD cross reference in Paragraph A; Revised Figure 6.7.9-1 to show single-slope traffic railing.
- 6.8.2 .....Revised hight limit for opening requirements in Paragraph C.
- 7.1.6 .....Added new Section.
- 7.3.7 .....Added new Paragraph H, MNCP box and Commentary per SDB 16-07.
- 7.4.4 .....Revised Figures 7.4.4-1, 7.4.4-2 and 7.4.4-3 to show single-slope traffic railings.
- 7.7 .....Deleted Paragraph D and renumbered subsequent paragraphs; Deleted Item 3 from (renumbered) Paragraph E.
- 8.6.12 .....Revised reference "ASTM A325" to "ASTM F3125 Grade A325" bolts in Paragraph E.

- 9.2.1 ..... Revised some unit prices; Added value for sheet piles with FRP in Paragraph G.2; Added values for Single-Slope Traffic Railings to Paragraph G.4 per SDB 16-06; Added new Paragraph I.
- 9.2.2 ..... Revised tables in Paragraphs B.2 and C.1 per SDB 16-01; Revised Table in Paragraph E.1 per SDB 16-06; Clarified measurement of Detour Bridge in Paragraph F.
- 9.4 ..... Added values for Single-Slope Traffic Railings per SDB 16-06.
- 10.5 ..... Revised Section.
- 11.6.3 ..... Revised equation and definition of  $C_0$  in Paragraph C.
- 11.7 ..... Added new Section per SDB 16-07.

**Volume 2 – Structures Detailing Manual**

- I.2 ..... Updated cross reference to CADD Manual in Paragraph D.
- I.4 ..... Updated cross reference to CADD Manual in Paragraph C.
- 2.12 ..... Updated cross reference to CADD Manual in Paragraph E.
- 2.16 ..... Revised Figure 2.16-1 to show single-slope traffic railing.
- 3.1 ..... Updated cross reference to CADD Manual in Paragraphs D and E.
- 3.5 ..... Updated cross reference to CADD Manual in 1st Paragraph and MNCP box.
- 3.8 ..... Updated cross reference to CADD Manual.
- 4.1 ..... Updated cross reference to CADD Manual in Paragraph B.
- 4.4 ..... Revised Figures 4.4-1, 4.4-2 and 4.4-4 to show single-slope traffic railings.
- 5.2 ..... Revised Paragraph F.3 to reflect new wind speed requirements; Revised Paragraph F4 to specify 600 kip force; Revised Paragraph G to specify Grade 60 carbon steel.
- 6.1 ..... Clarified that links provide access to .dgn and .pdf files of design aids and added image with link to .pdf in Paragraph B.
- 13.8 ..... Revised Figures 13.8-1, 13.8-2 and 13.8-3 to show single-slope traffic railings.
- 13.10 ..... Revised Figures 13.10-1 and 13.10-3 to show single-slope traffic railings.
- 13.11 ..... Revised Figure 13.11-1 to show single-slope traffic railings.
- 15.5 ..... Revised Figure 15.5-4 Note #3 and Detail B.
- 15.8 ..... Revised Figure 15.8-3 to show single-slope traffic railings; Revised Figure 15.8-5 View B-B.
- 15.9 ..... Revised Figures 15.9-3 and 15.9-5 to show single-slope traffic railings; Revised weld note in Figures 15.9-4 and 15.9-6.
- 16.8 ..... Revised Figure 16.8-1 to show single-slope traffic railings.
- 18.2 ..... Revised Figure 18.2-3 to show single-slope traffic railings.
- 18.5 ..... Revised Figure 18.5-1 to show single-slope traffic railings.

- 19.2 ..... Clarified requirements for wall control drawings in 1st Paragraph and MNCP Box.
- 19.6 ..... Revised Figures 19.6-2, 19.6-3 and 19.6-4 to show single-slope traffic railings.
- 19.6.1 ..... Revised Figures 19.6.1-2, 19.6.1-3 and 19.6.1-4 to show single-slope traffic railings.
- 19.7 ..... Added cross reference to PPM.
- 19.7.2 ..... Clarified requirements of 3rd Paragraph and deleted MNCP box; Revised Figure 19.7.2-1 to show single-slope traffic railings.
- 20.8 ..... Revised Section and added Figures 20.8-1 through 20.8-10 per SDB 16-07 with subsequent modifications.
- 22.2 ..... Revised Figures 22.2-2, 22.2-3 and 22.2-4 to show single-slope traffic railings.
- 22.3 ..... Revised Figure 22.3-1 to show single-slope traffic railings.
- 22.3.1 ..... Revised Figure 22.3.1-1 to show single-slope traffic railings.
- 23.7 ..... Revised Paragraph C, Figures 23.7-1 and 23.7-2 and added Figures 23.7-3 and 23.7-4 per SDB 16-07.
- 25.4.3.5 ..... Revised Figure 25.4.3.5-1 to reflect use of Flexible Filler.
- 25.4.3.10 ..... Revised Figure 25.4.3.10-1 to show single-slope traffic railing.

**Volume 3 - *FDOT Modifications to LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals (LRFDLTS-1)***

- 1 ..... Revised Volume 3 extensively throughout to coordinate with the new LRFDLTS-1.

**Volume 4 - *Fiber Reinforced Polymer Guidelines***

- 2.1 ..... Added Traffic Railings to Paragraph A; Added new Paragraph B and renumbered subsequent Paragraph.
- 2.3 ..... Revised Specification cross reference in Paragraph B; Revised Paragraph E Table to provide cover value specific to Panels.
- 2.4 ..... Revised Specification cross reference.
- 3.1 ..... Added reference to Design Standards for square and round piles.
- 3.3 ..... Revised Specification cross references, revised jacking stress value, and added maximum concrete tensile stress value in Paragraph A.
- 3.4 ..... Revised Specification cross reference.
- 7.2 ..... Revised Specification cross reference.