Florida Department of Transportation

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STRUCTURES DESIGN BULLETIN C12-02

ROADWAY DESIGN BULLETIN 12-04

DATE: February 1, 2012

TO: District Directors of Operations, District Directors of Production, District Design Engineers, District Construction Engineers, District Structures Design Engineers

FROM: Robert V. Robertson, P. E., State Structures Design Engineer
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SUBJECT: Implementation of Requirements for use of Uncoated Weathering Steel and Coating Systems for Steel Bridges

This bulletin implements requirements for Uncoated Weathering Steel and Coating Systems for new Steel I-Girder and Box-Girder Bridges.

REQUIREMENTS

1. 2012 Structures Manual, Volume 1: Structures Design Guidelines (SDG)

Add the following paragraph to SDG 1.3.2:

E. Site conditions for the use of uncoated weathering steel shall meet the following requirements:

1. Superstructure shall be classified as Slightly Aggressive.
2. Yearly average Time of Wetness (TOW), as determined by ASTM Test G84, shall not exceed 60%.

3. If the structure is located within 4.0 miles of the coast:
    a. The maximum airborne salt deposition rate, as determined by ASTM Test G140, shall be 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, shall not exceed 60 mg/m^2/day (measured over a 30 day period).
4. Minimum vertical clearance over normal high water/mean high water is 12 feet.

Contact the State Materials Office (SMO) regarding Time of Wetness, airborne salt deposition rate, and average SO_2 concentration at the proposed project site.

Replace SDG 5.1 paragraph A with the following:

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. 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 T 5140.22 for additional information.

Delete SDG 5.3.1 paragraph D and replace SDG 5.3.1 paragraph C with the following:

C. Miscellaneous hardware, including shapes, plates, and threaded bar stock, (except when used on uncoated weathering steel structures) shall conform to ASTM A709, Grade 36.

Replace SDG 5.12 with the following:

5.12 Corrosion Protection

A. Specify method of protection and locations on structure. Specify one of the following for treatment of exterior and/or interior girders:
    1. Uncoated Weathering Steel. See ***SDG*** 1.3 for suitable site requirements for the use of uncoated weathering steel. See ***SDM*** Chapter 16 for preferred details.
    2. Inorganic Zinc Coating System. Specify an Inorganic Zinc Coating System in accordance with ***Specification*** Section 975.
    3. High Performance Coating System. Specify a High Performance Coating System in accordance with Specification Section 975. The default color is a uniform gray similar to Federal Standard No. 595, Color No. 36622. Other colors or a gloss finish must be approved by the District in consultation with the State Materials Office (SMO).

B. 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

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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).

5.12.1 Environmental Testing for Site Specific Corrosion Issues

A. Contact the State Materials Office (SMO) early in the BDR phase of the project to determine if the bridge location meets the environmental conditions for the use of uncoated weathering steel.

B. Where coating of steel is required the following site specific criteria may require specialty corrosion protection systems:

1. Locations where the pH of the rainfall or condensation is less than 4 and greater than 10.
2. Locations subject to salt spray and salt laden run-off.
3. Locations subject to concentrated pollution caused by the following sources: coal burning power plant, phosphate plant, acid manufacturing plant, any site yielding high levels of sulfur compounds.

C. For sites with any of the above conditions, a review and recommendation from the SMO is required to identify the appropriate corrosion control coating system.

5.12.2 Galvanizing

A. Galvanizing of Bolts for Bridges: Specify all anchor bolts, nuts, washers and other associated tie-down hardware to be hot-dip galvanized. Specify galvanized A325 bolts for connecting painted structural steel members on a project specific basis as directed by the District.

B. Galvanizing of Bolts for Miscellaneous Structures: Specify bolts for connecting structural steel members of miscellaneous structures such as overhead sign structures, traffic mast arms, ground-mounted signs, bridge mounted signs, etc. to be hot-dip galvanized.

Commentary: While ASTM A307 (coarse thread) bolts must be hot-dip galvanized, A325 (fine thread) bolts must be mechanically galvanized when they are required to be fully tensioned. Other applications not requiring full tensioning of the bolts may use hot-dip galvanized A325 bolts.

C. Specify all ladders, platforms, grating and other miscellaneous steel items to be hot-dip galvanized.

Replace SDG 7.3.1 paragraph C with the following:

C. Consider specifying a Class 5 Finish coating for the existing bridge. If colors other than those identified in the Specifications are proposed, specify the Federal Standard 595 color number on the plans.

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2. 2012 Structures Manual, Volume 2: Structures Detailing Manual (SDM)

Replace SDM 4.4 paragraph A with the following:

A. A "Class 5 Applied Finish Coating" is a textured coating utilized as a final concrete finish in lieu of a "Class 1 Surface Finish" (see ***Specifications*** Section 400). A "Class 5 Applied Finish Coating" is generally required for use on concrete traffic and pedestrian railings, concrete sound barriers, cast-in-place retaining walls and other portions of bridges as shown in Figure 4.4-1, Figure 4.4-2 and Figure 4.4-3. A "Class 5 Applied Finish Coating" may or may not be required for use on precast portions of proprietary retaining walls as shown in Figure 4.4-4 depending on project specific aesthetic requirements. For bridges and retaining walls, show appropriate "Class 5 Applied Finish Coating" notes in the General Notes and the corresponding Surface Finish Details on the General Notes drawing. For sound barriers, see the ***Instructions for Design Standards*** Index 5200. If the finish color is other than Federal Standard No. 595, Color No. 36622 (standard concrete gray) (or Color No. 36642 for uncoated weathering steel bridges), specify the appropriate number(s) for the desired color(s). Do not use generic or brand names for colors, e.g. Pearl Grey.

Replace SDM 5.3 paragraph F with the following:

F. Painting

Specify one of the following notes as applicable:

1. Weathering steel is to remain uncoated, except as required by the ***Specifications***. (Steel Box-Girders)
2. Paint the outside face and bottom of Exterior Girders with an Inorganic Zinc Coating System. Interior Girders and diaphragms/cross-frames are to remain unpainted.
3. Paint the outside face and bottom of Exterior Girders with a High Performance Coating System. The color of the finish coat shall conform to Federal Standard No. 595, Color No. XXXXX. Interior Girders and diaphragms/cross-frames are to remain unpainted.
4. Paint all steel with an Inorganic Zinc Coating System.
5. Paint the outside face and bottom of Exterior Girders with a High Performance Coating System. The color of the finish coat shall conform to Federal Standard No. 595, Color No. XXXXX. Paint Interior Girders and diaphragms/cross-frames with an Inorganic Zinc Coating System.
6. Paint all steel with a High Performance Coating System. The color of the finish coat shall conform to Federal Standard No. 595, Color No. XXXXX.

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Add SDM 16.12 as follows:

16.12 Special Details for Uncoated Weathering Steel Bridges

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.

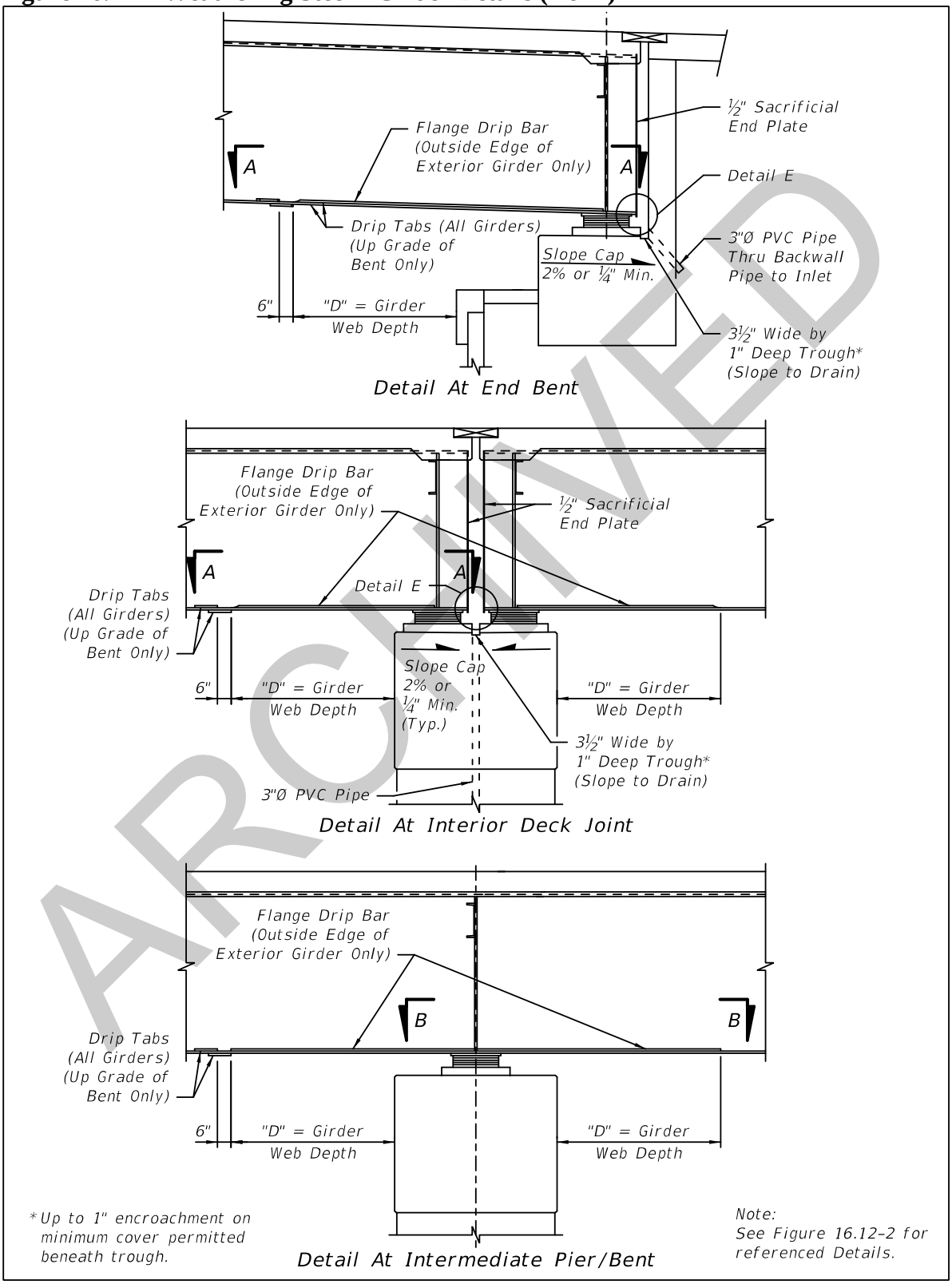
D. Provide a ½" thick sacrificial end plate at the ends of all I-girders to protect girders from leaky joints.

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

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

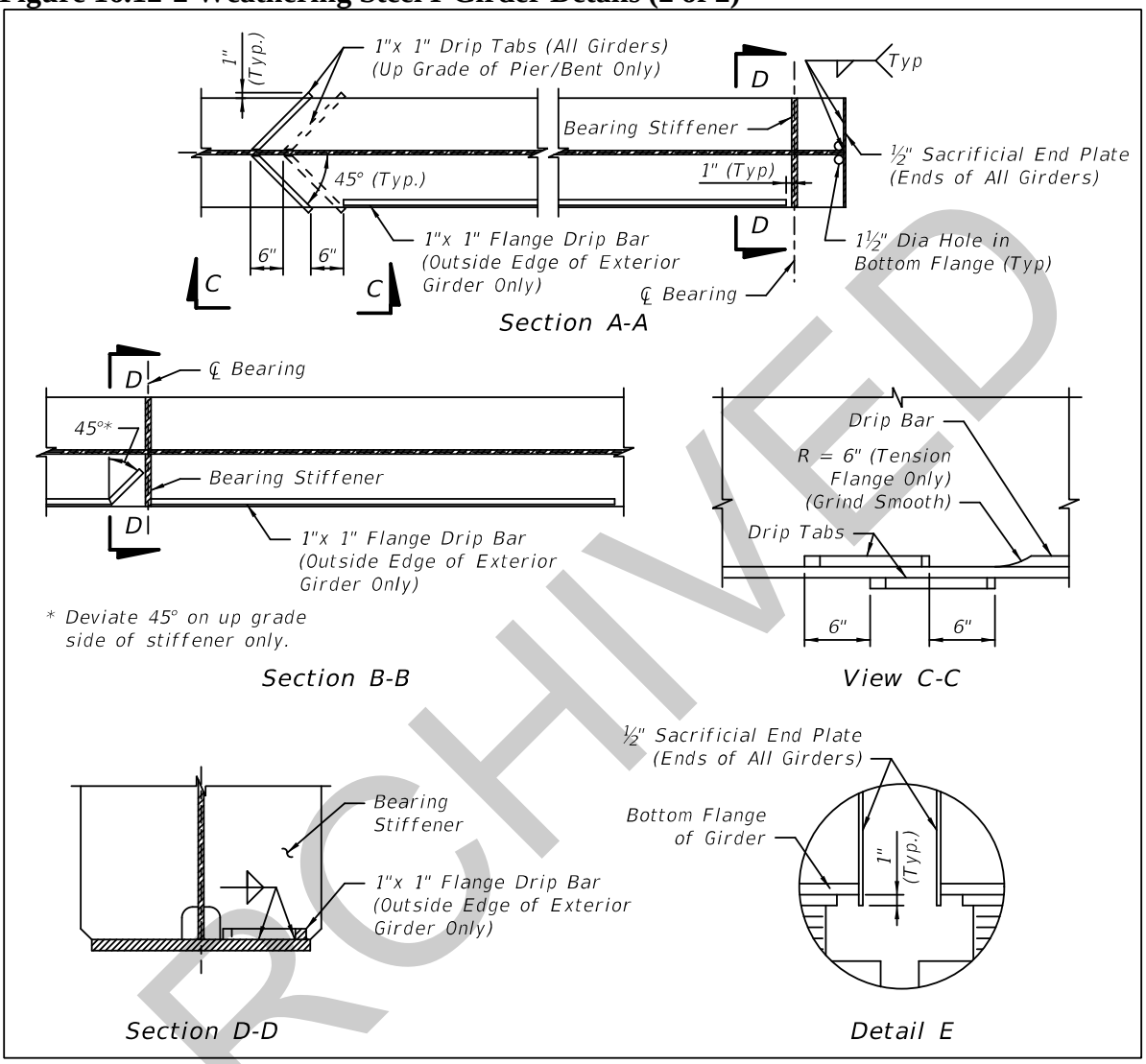
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Figure 16.12-1 Weathering Steel I-Girder Details (1 of 2)



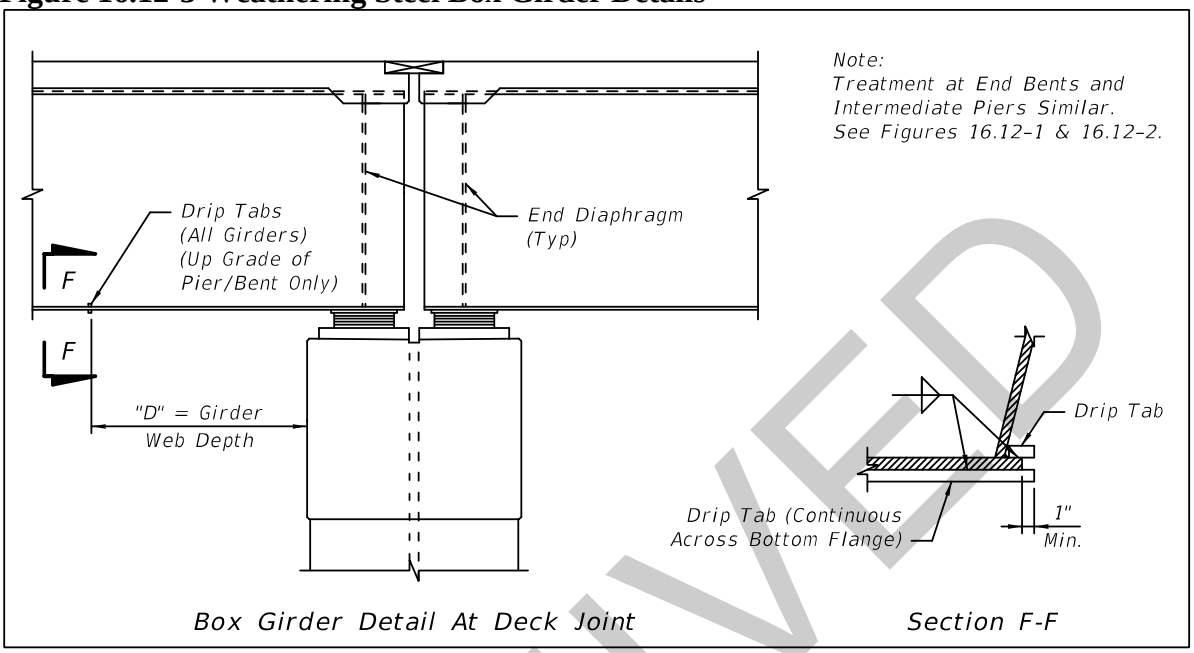
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Figure 16.12-2 Weathering Steel I-Girder Details (2 of 2)



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Figure 16.12-3 Weathering Steel Box Girder Details



3. 2012 Plans Preparation Manual (PPM), Volume 1

Add the following paragraph to the end of PPM 26.9.4.2:

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 Steel I-Girder or Box-Girder bridges requires written approval from the Chief Engineer.

COMMENTARY

Uncoated weathering steel has been used on a number of bridges in Florida in the past and has demonstrated good performance over the years. While the Department's specifications and guidelines currently provide guidance for use of uncoated weathering steel in bridges, the increased usage due to this policy change warrant additional guidelines and details to reduce potential for corrosion of the steel structure as well as unsightly staining of substructure elements.

BACKGROUND

Weathering steel has been in use in the United States since 1933 and its usage is growing with the introduction of New High Performance Steel (HPS) and its improved weathering characteristics. The benefits of using weathering steel in Florida's bridges include: reduced fabrication time and costs; avoided construction time and cost of field painting; and reduced future maintenance costs/traffic impacts for repainting.

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Where environmental/site conditions are appropriate for its use, uncoated weathering steel is to be used for all new steel I-girder and box-girder bridges. An Inorganic Zinc Coating System is to be specified for all other locations. Exemptions to these requirements may be obtained where aesthetic considerations warrant and written approval is granted by the Chief Engineer.

IMPLEMENTATION

Implement the requirements set forth herein on projects meeting the following criteria:

- All Design/Bid/Build Projects let after June 30, 2012
- All Design/Build projects for which the Final RFP has not been released as of the date of this Bulletin

Construction projects let before June 30, 2012 may incorporate these new requirements subject to the Cost Savings Initiative Proposal provisions of Subarticle 4-3.9.

Specifications will be implemented in the January 2012 Workbook with an effective date of February 2012.

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Attachments

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