To:		New York State Department of Transportation ENGINEERING INSTRUCTION	EI 98-012

SUPERSEDED BY EB99-024
EFFECTIVE 3/16/99

Title: **BRIDGE DETAIL (BD) SHEETS RS1 THROUGH RS8: STEEL BRIDGE RAILING, AND FD1 THROUGH FD3: SNOW AND PEDESTRIAN FENCING**

Distribution:
- ☒ Manufacturers (18)
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- ☒ Contractors (39)
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Approved:

James M. O'Connell
Deputy Chief Engineer (Structures)

4/7/98
Date

EFFECTIVE DATE:

This EI is effective with the letting of October 22, 1998.

If possible it should be implemented on projects let before this date.

PURPOSE:

This EI issues new standard details for bridge railing and rescinds most previous standard details for bridge railings. These new railings are a significant change to the Department's current bridge railings. Changes have been made to improve strength and crash worthiness. These railings and transitions have been designed to a TL-4 level under NCHRP 350. Crash tests will be performed in the near future. Because of the test results of similar systems, it is anticipated that these crash tests will be successful. In addition, details have been simplified to create more economical railings. This EI also issues new standard details for permanent snow fence and pedestrian fencing that are appropriate for use with the railing systems. The existing specifications Pedestrian Fencing For Bridges, Item 16607.0640 M and Snow Fencing For Bridges, Item 16607.0641 M should continue to be used with these new details.

BDD 94-44C and 94-M44C are being retained for the present time for situations where snow fence needs to be installed on existing railing systems.

Further background and criteria for selecting bridge railing and barrier are contained in Section 6 of the soon to be released Structures Design and Construction Division *Bridge Manual*.

SUPERSEDED ISSUANCES:

This EI supersedes EB 98-010 and modifies EB 97-044 which contained a current index of Structures Division issuances.

This EI rescinds the following BDD sheets:

BDD 96-18
BDD 96-M18
BDD 96-44
BDD 96-M44
BDD 96-44A
BDD 96-M44A
BDD 94-44B
BDD 94-M44B
BDD 81-50A
BDD 79-50B
BDD 98-51A
BDD 98-M51A
BDD 98-51B
BDD 98-M51B
BDD 98-51C
BDD 98-M51C
BDD 98-52A
BDD 98-M52A
BDD 98-52B
BDD 98-M52B
BDD 98-52C
BDD 98-M52C
BDD 98-59A
BDD 98-M59A
BDD 98-59B
BDD 98-M59B
BDD 98-59C
BDD 98-M59C
BDD 95-72
BDD 95-M72
BDD 95-72A
BDD 95-M72A
BDD 95-73
BDD 95-M73
BDD 95-73A
BDD 95-M73A
BDD 95-74
BDD 95-M74

The following GLD sheets are rescinded:

GLD MC3
GLD MMC3

The following pay items are disapproved:

568.01	568.10M	568.40M
568.02	568.11M	568.41M
568.10	568.12M	568.42M
568.11	568.13M	568.43M
568.12		
568.13		

Section 710-23, Steel Bridge and Culvert Railing, of the Standard Specifications of January 2, 1995 is superseded.

NEW ISSUANCES:

BD sheets BD-RS1 through BD-RS8 are issued.

BD sheets BD-FD1 through BD-FD3 are issued.

Changes to Sections 568 of the Standard Specifications of January 2, 1995 and a revised Section 710-23 are transmitted.

The following pay items are established:

568.50 M - Steel Bridge Railing (Two Rail)
568.51 M - Steel Bridge Railing (Four Rail)
568.52 M - Steel Bridge Railing (Five Rail)
568.53 M - Steel Bridge Railing (Two Rail) with Handrail
568.60 M - Steel Bridge Railing - Rustic (Two Rail)
568.61 M - Steel Bridge Railing - Rustic (Four Rail)
568.62 M - Steel Bridge Railing - Rustic (Five Rail)
568.63 M - Steel Bridge Railing - Rustic (Two Rail) with Handrail

ACTIONS BY MAIN OFFICE DQAB:

The attached specification changes will be Main Office inserts into contract proposals which contain the referenced item numbers.

SLAB REINFORCEMENT:

Reinforcement in structural deck slabs must be increased from present requirements for the new railing systems. This is necessary to assure that the deck slab is stronger than the railing system, as required by AASHTO. This minimum reinforcement does not apply to bridges with adjacent prestressed concrete units.

Top transverse reinforcement shall be a minimum of 1900 mm^2 per meter. For bridges with isotropic deck reinforcement, this is #13 bars alternated with #19 bars at 100 mm spacing. The bars must be hooked at the fascia and extended beyond the fascia girder for their development length. The spacing of the bars must be reduced if they are placed on a skew.

In addition a minimum of 4 - #16 bars in the top mat and 3 - #16 bars in the bottom mat must be placed longitudinally in the area of the railing anchorage.

Specific details of the reinforcement will be issued in future BD sheets.

CONTACT:

Any questions regarding this EI should be directed to the Structures Division Standards Unit at (518) 485-5748.

BRIDGE AND CULVERT RAILING

Make the following changes to Section 568 of the Standard Specifications of January 2, 1995.

Section 568, Bridge and Culvert Railing:

Page 5-109, Line 39
Change "may" to "shall"

Page 5-110, Line 4
Add "Significant" before "Bends or kinks..."

Page 5-110, Lines 37-41 and page 5-111, Line 1
Delete paragraph "K" and replace with the following:

K. Rail Span. The rails of railings shall span the following minimum number of posts:

Railing Type	**Number of Posts**
Two-Rail, Steel	3 (*)
Four-Rail, Steel	3
Five-Rail Steel	3
Box Beam Culvert	3 (*)

(*) If this is not possible, the absolute minimum shall be 2 posts if approved by the D.C.E.S.

Page 5-112, Delete lines 22-25 and replace with the following:

568.50 M - Steel Bridge Railing (Two-Rail)
568.51 M - Steel Bridge Railing (Four-Rail)
568.52 M - Steel Bridge Railing (Five-Rail)
568.53 M - Steel Bridge Railing (Two-Rail) with Handrail

Page 5-112, Delete Lines 28-31 and replace with the following:

568.60 M - Steel Bridge Railing - Rustic (Two-Rail)
568.61 M - Steel Bridge Railing - Rustic (Four-Rail)
568.62 M - Steel Bridge Railing - Rustic (Five-Rail)
568.63 M - Steel Bridge Railing - Rustic (Two-Rail) with Handrail

710-23 STEEL BRIDGE AND CULVERT RAILING

SCOPE. This specification covers the material requirements for Steel Bridge and Culvert Railing and its component parts.

MATERIAL REQUIREMENTS. Steel Bridge and Culvert Railing materials shall conform to the following requirements:

Piece	ASTM Designation
Rail Tubes	A500 Grade B (1)
Rail End Caps	A36M or A588M (A709 Grade 250 or 345W)
Base Plates (2)	A588M or A572M Grade 345 (A709M Grade 345 or 345W)
Anchor Studs	F568M Class 8.8
Splice Bolts,	F568M Class 8.8 or Class 8.8.3
Round Head Square Neck Threaded Bolt (Carriage Bolts)	F568M Class 4.6
Nuts (3)	A563M
Washers (3)	F436M
Anchor Plates	A36M (A709M Grade 250)
Plate Shims	A36M or A588M (A709M Grade 250 or 345W)
Tube Rail Splices	A519 Grade 1018, 1020 or 1026 Hot Finished
Solid Rail Splices	A588M or A572M Grade 345 (A709M Grade 345 or 345W)
Splice Plates	A588M or A572M Grade 345 (A709M Grade 345 or 345W)
Railing Post (2)	A588M or A572M Grade 345 (A709M Grade 345 or 345W)

(1) Where unpainted A588M (A709M Grade 345W) steel is used for the post, the tube shall be unpainted A500 Grade B with the chemical properties of either A588M (A709M Grade 345W) or A606, Type 4. Railing tube meeting the foregoing requirements will be acceptable if its elongation is a minimum of 21% in 50 mm.

(2) All post material, including base plates, shall be furnished to minimum Charpy V-Notch Toughness requirements as required by §715-01, under Charpy V-Notch Impact test.

(3) Use the following nut and washers for the given bolt class:

BOLT or STUD class	NUT (A563M class & dimension style of nut)	WASHER (F436M type)
4.6	5 H1	1 or 3
8.8	10S HH	1 or 3
8.8.3	8S3 HH	3

Beveled shims may be machined from the same type of metal as in the post base plates or may be cast from material conforming to the requirements of §715-02, Steel Castings, or §715-09, Malleable Iron Castings.

All rail shall be tested in accordance with ASTM E436 - "Drop-Weight Tear Tests of Ferritic Steels", except as modified below.

The tests shall done after all galvanizing and associated operations have been performed on the rail. The testing shall be conducted at a temperature of -18°C, without removing the galvanizing, on 50 mm x 230 mm specimens supported to achieve a 180 mm span.

The percent shear will be determined by testing nine (9) specimens, three (3) from each of three (3) sides not containing a weld. The shear areas of the three specimens from the side with the lowest average shear area shall be disregarded and the final average based on the remaining six specimens. If the average percent shear area falls below 50 the material represented by these tests shall be rejected.

To facilitate acceptance and rejection of material, the manufacturer of the structural shape shall, before galvanizing, identify the product with the steel heat number, or some number which is traceable to the heat number, and its own unique identification code. The identification method shall be such that it can be read after the structural shape is galvanized. The identification information shall be placed on the structural shape at intervals not to exceed 1.2 m.

Fabrication. Bridge and Culvert Railing shall be fabricated to the dimensions shown in the contract plans and in compliance with the specifications.

*1. **Shop Drawings.*** Shop drawings shall be provided in accordance with the requirements of the S.C.M., except that: 1) the drawings shall be submitted to the Engineer for review and approval and 2) the computed weights need not be shown.

*2. **Welding.*** Shop welding shall be performed only where specifically noted on the contract documents. Transverse welds shall not be permitted unless directly called for on the contract plans. All welding shall be done in accordance with the requirements of the SCM.

*3. **Cutting.*** All exposed flame cut surfaces shall have a surface roughness not to exceed 250, as defined by the ANSI standard specification B46.1. Grind all edges of Posts and Post Base Plates so that all sharp edges are removed.

*4. **Bending.*** Rails for curved structures shall be curved in the shop prior to galvanizing. To facilitate bending, rails may be heated to a temperature not exceeding 650°C.

5. Galvanizing. Galvanizing shall conform to the requirements of §719-01, Galvanized Coatings and Repair Methods, Type I. All components of the railing, including anchor studs, nuts and washers, shall be galvanized. The rails, post assemblies, splices and all hardware shall be fabricated and ready or assembly prior to galvanizing.

All galvanized bolts and galvanized anchor studs shall have a Class 6g Thread. All galvanized nuts shall have a standard oversized tap to allow for the galvanizing on the bolts and nuts.

Shop galvanizing repair of uncoated areas will be permitted on localized areas. Repair of localized areas is limited to a total of 1300 mm^2 on any post or rail. A post or rail which contains galvanizing defects totaling more than 1300 mm^2 shall be stripped and regalvanized.

Shop repair shall be made in accordance with the methods given in §719-01.

The following areas will not require galvanizing repair: One 3 mm maximum dimension spot of tight flux remaining in the fusion line of any 180 mm length of weld after blast cleaning picking and galvanizing.

6. Painting Rustic Railing. When paint is used to obtain a rustic appearance, all components of the railing system shall be galvanized and then, after erection, the visible portions of the system shall be painted with one coat of finish paint in accordance with the following:

a. The color of the finish coat shall be Weathered Brown and conform to Federal Color Standard No. 595a, Color 20059.

b. Paint shall be one of the products on the Department's Approved List titled "Moisture-Curing Urethane Paint Systems, C. Finish Paint". Acceptance shall be based on the appearance of the paint on the Approved List.

c. All galvanized surfaces shall first be cleaned of oil, grease and similar contaminants by hand wiping with solvent in accordance with SS PC-SP1, solvent cleaning.

d. After solvent cleaning, all galvanized surfaces shall be lightly abraded by brush blast methods. The purpose of the abrasive blasting is to roughen the surface, not to remove material.

e. Apply the paint using brushes or rollers in accordance with the Manufacturer's instructions to a minimum dry film thickness as given in the approved list. Manufacturer's instructions for mixing and paint application shall be supplied to the Engineer at least one week prior to the beginning of any painting work.

BASIS OF ACCEPTANCE. The manufacturer shall furnish the Department with three (3) certified copies of physical test and chemical analysis of the materials used in the manufacture of the railing. Check analysis may be made by the Department from delivered material.

Inspection will be performed in accordance with the provisions of the SCM, except that mill inspection will not be done.

Materials that do not bear the Inspector's mark of acceptance, shall not be accepted at the project site.