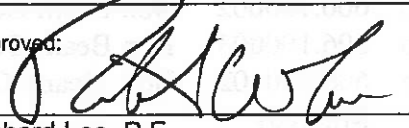


SUPERSEDED BY EB 15-031 EFFECTIVE 9/28/15		New York State Department of Transportation ENGINEERING INSTRUCTION	EI 12-003
Title: SHOP BENT AND SHOP MITERED BOX BEAM GUIDE RAIL AND MEDIAN BARRIER			
Target Audience: ☒ Manufacturers (18) ☒ Local Govt. (31) ☒ Agencies (32) ☐ Surveyors (33) ☒ Consultants (34) ☒ Contractors (39) ☐ _____ ()		Approved:  Richard Lee, P.E. Acting Deputy Chief Engineer (Design) 3/28/12 Date	

ADMINISTRATIVE INFORMATION:

- This Engineering Instruction (EI) is effective beginning with projects submitted for the letting of September 6, 2012.
- This EI does not supersede any other issuance.
- The revisions issued with this EI will be incorporated into the next update of the Standard Specifications.

PURPOSE:

The purpose of this EI is to announce revisions to Standard Specification 606 – Guide Railing.

TECHNICAL INFORMATION:

- New items for shop bending and shop mitering have been created to replace the items for shop curving of box beam guide rail and median barrier
- When specifying box beam guide railing with a radius over 20 feet and less than 720 feet, designers should specify Shop Bent Box Beam.
- When specifying box beam guide railing with a radius twenty (20) feet or less designers should specify Shop Mitered Box Beam.
- When specifying box beam median barrier with a radius over 30 feet and less than 1525 feet, designers should specify Shop Bent Box Beam Median Barrier,
- When specifying box beam median barrier with a radius thirty (30) feet or less designers should specify Shop Mitered Box Beam Median Barrier.
- The current items for shop curved box beam guide rail are disapproved and replaced by new items for shop bent and shop mitered guide rail.
- The current items for shop curved box beam median barrier are disapproved and replaced by new items for shop bent and shop mitered median barrier.
- There should be minimal cost impacts as a result of the above changes, as mitered box beam is infrequently needed. Also, there should be little change in the amount of shop bent and shop mitered box beam being used compared to present usage.
- For estimating purposes, until a representative bid history is developed for the new items, designers should assume that shop bent costs will match current cost for shop curving while shop mitered costs will be seven times current costs for shop curved.

IMPLEMENTATION:

- Main Office Design Quality Assurance Bureau will insert the standard specification revision into contract proposals containing 606 series items beginning with projects submitted for the letting of 9/6/12.

- Disapproved Specifications: The following contract pay items are disapproved:
 - 606.100001 Box Beam Guide Railing (Shop Curved)
 - 606.100101 Box Beam Guide Railing with Extra Long Posts (Shop Curved)
 - 606.110001 Box Beam Median Barrier (Shop Curved)
- Approved Specifications: The following new contract pay items are approved:
 - 606.100002 Box Beam Guide Railing (Shop Bent or Shop Mitered)
 - 606.100003 Box Beam Guide Railing (Shop Mitered)
 - 606.100102 Box Beam Guide Railing with Extra Long Posts (Shop Bent or Shop Mitered)
 - 606.100103 Box Beam Guide Railing with Extra Long Posts (Shop Mitered)
 - 606.110002 Box Beam Median Barrier (Shop Bent or Shop Mitered)
 - 606.110003 Box Beam Median Barrier (Shop Mitered)

TRANSMITTED MATERIALS:

This EI transmits revisions to standard specification Section 606 – *Guide Railing*. Both Metric and U.S. Customary revisions are attached.

BACKGROUND: Shop curving of box beam guide rail has usually been performed by simple bending processes. However, at tight radii, bending is not sufficient and it becomes necessary to take “pie-cuts” down through the beam, bend the beam to close the cuts, and weld the edges of the triangular cuts together. The cost of this cutting and welding procedure is much more expensive than conventional bending, typically being around seven times as costly. Designers were not able to know at what radius the use of the more expensive process would be needed. With the new items, where a site permits some leeway in choice of radius, designers may be able to select a radius that permits use of the less expensive process.

No specification details existed to control when the more expensive shop mitering process was appropriate, nor how either process was to be performed. As a result, some attempts to bend to too tight a radius resulted in aesthetically inferior results.

Bid prices for shop curved box beam sometimes varied significantly in response to the amount of shop mitering included in the shop curving quantity. This variation affected the precision of making cost estimates for shop curved box beam.

We are aware of one smaller contractor who prepared a local bid based on previous shop curving quotations that had not required shop mitering. This contractor was financially hard hit when it turned out that mitering was required for most of the numerous tight radius curves on the project. The new items should help to ensure that the appropriate method, either shop bending or shop mitering, is used for a given situation and that contractors are bidding on the correct type of shop fabrication process.

CONTACT: Direct questions regarding this issuance to Terry Hale of the Design Quality Assurance Bureau at (518) 485-7009 or via e-mail at thale@dot.state.ny.us.

SECTION 606 – GUIDE RAILING

Make the following changes to the Standard Specifications dated May 1, 2008:

Page 507, Delete the last two sentences and Table 606-1 under **§606-3.01D. Erection**, and Replace them with the following:

“ Box beam to be installed on a curved alignment shall be shop bent or shop curved in accordance with Table 606-1.

TABLE 606-1 SHOP BENDING AND SHOP MITERING OF BOX BEAM GUIDE RAILING AND MEDIAN BARRIER		
Barrier Type	Shop Bending Required	Shop Mitering Required
Box Beam Guide Railing	Radius over 20 ft and less than 720 ft	Radius of 20 ft or less
Box Beam Median Barrier	Radius over 30 ft and less than 1525 ft	Radius of 30 ft or less

When shop bending or shop mitering of box beam guide railing or box beam median barrier is required, the rail element shall be shop-worked to the radius that the barrier will be installed on.

Corrugated beam guide railing and median barrier shall require shop curving if the radius is equal to or less than 150 feet. When shop curving of corrugated beam is required, the rail element shall be shop-worked to the radius that the barrier will be installed on.”

Page 515, Delete §606-4.01 and Replace it with the following:

“606-4.01 Cable, Corrugated Beam or Box Beam Guide Railing and Median Barrier. The quantity to be measured for payment will be in feet to the nearest foot of guide railing or median barrier installed, measured along the axis of the railing and between its pay limits as shown on the plans and/or standard sheets. The quantity to be measured for payment will be in feet to the nearest foot of shop bent or shop mitered guide railing or median barrier installed.

If the guide railing does not terminate at an anchorage unit, end assembly, or transition to another type of barrier, but is anchored to a structure, the railing will be measured up to the structure.”

Page 517, Delete the second paragraph of §606-5.01 and Replace it with the following:

“ Payment for corrugated guide rail and median barrier, or bent box beam guide rail, will be determined using the payment factors for the various typical post spacings listed in Table 606-2. Payment will be the sum of the products obtained by multiplying the unit price bid for a rail or median barrier by the payment factors listed in Table 606-2 for the relevant post spacings and multiplying each of those products by the length of rail having that given post spacing.

Payment for mitered box beam and median barrier with 6 foot post spacings will be made at the unit prices bid. If a reduced post spacing of 3 feet is used for mitered box beam guide rail, the payment will be determined by multiplying the unit price bid by a payment factor of 1.1 for the length installed.”

Page 519, Remove the following items from the list of pay items

606.100001	Box Beam Guide Railing (Shop Curved)
606.100101	Box Beam Guide Railing With Extra Long Posts (Shop Curved)
606.110001	Box Beam Median Barrier (Shop Curved)

Page 519, Add the following pay items:

606.100002	Box Beam Guide Railing (Shop Bent or Shop Mitred)	Foot
606.100003	Box Beam Guide Railing (Shop Mitred)	Foot
606.100102	Box Beam Guide Railing with Extra Long Posts (Shop Bent or Shop Mitred)	Foot
606.100103	Box Beam Guide Railing with Extra Long Posts (Shop Mitred)	Foot
606.110002	Box Beam Median Barrier (Shop Bent or Shop Mitred)	Foot

SECTION 606 -- GUIDE RAILING

606.110003 Box Beam Median Barrier (Shop Mitered)

Foot

Page 860, §710-21 **BOX BEAM GUIDE RAILING AND MEDIAN BARRIER**, Insert the following section immediately prior to **BASIS OF ACCEPTANCE**:

"FABRICATION. Curved box beam guide rail or median barrier shall be shop bent or shop mitered in accordance with the following. At the fabricator's option, the shop mitering process may be used instead of a shop bending process. However, shop bending may not be used in place of shop mitering.

1. Shop Bent Box Beam Guide Railing. Box beam guide rail installed on a curved alignment with a radius above 20 and up to 720 feet shall be shop bent prior to galvanizing. In order to achieve a smooth arc, the bend points shall be placed no farther apart than two feet when the radius is from 20 to 50 feet, no farther apart than three feet when the radius is between 50 and 150 feet, and no farther apart than four feet when the radius is 150 feet or greater.

2. Shop Mitered Box Beam Guide Railing. Box beam guide railing installed on a curved alignment with a radius of 20 feet or less shall be miter cut and welded in the shop prior to galvanizing. For radii less than 12 feet, the average spacing of the cuts shall be approximately 18 inches. For radii from 12 feet to 20 feet, the average spacing of the cuts shall not exceed 24 inches. Cut locations shall be adjusted as needed to avoid bolt holes and post brackets. After the miter cuts are completed, backer bars shall be tack welded to one side of the cut and the miter shall be closed to within a quarter of an inch (+ 0", -1/8") and butt welding performed in accordance with AWS D1.1. Section 3.

3. Shop Bent Median Box Beam Barrier. Box beam median barrier installed on a curved alignment with a radius above 30 and up to 1525 feet shall be shop bent prior to galvanizing. For radii between 30 and 60 feet, the bending shall be performed prior to cutting the slots for the post support paddles. In order to achieve a smooth arc, the bend points shall be placed no farther apart than 18 inches.

4. Shop Mitered Box Beam Median Barrier. Box beam median barrier installed on a curved alignment with a radius of 30 feet or less shall be miter cut and welded in the shop prior to galvanizing. For radii less than 12 feet, the average spacing of the cuts shall be approximately 18 inches. For radii of 12 feet or greater, the average spacing of the cuts shall not exceed 24 inches. Cut locations shall be adjusted as needed to avoid post support slots. After the miter cuts are completed, backer bars shall be tack welded to one side of the cut and the miter shall be closed to within a quarter of an inch (+ 0", -1/8") and butt welding performed in accordance with AWS D1.1. Section 3."

SECTION 606 – GUIDE RAILING

Make the following changes to the Standard Specifications dated May 4, 2006:

Page 502, **Delete** the last two sentences and Table 606-1 under **§606-3.01D. Erection**, and **Replace** them with the following:

“ Box beam to be installed on a curved alignment shall be shop bent or shop curved in accordance with Table 606-1.

TABLE 606-1 SHOP BENDING AND SHOP MITERING OF BOX BEAM GUIDE RAILING AND MEDIAN BARRIER		
Barrier Type	Shop Bending Required	Shop Mitering Required
Box Beam Guide Railing	Radius over 6 and less than 220 m	Radius of 6 m or less
Box Beam Median Barrier	Radius over 9 m and less than 465 m	Radius of 9 m or less

When shop bending or shop mitering of box beam guide railing or box beam median barrier is required, the rail element shall be shop-worked to the radius that the barrier will be installed on.

Corrugated beam guide railing and median barrier shall require shop curving if the radius is equal to or less than 45 m. When shop curving of corrugated beam is required, the rail element shall be shop-worked to the radius that the barrier will be installed on.”

Page 510, **Delete** §606-4.01 and **Replace** it with the following:

“606-4.01 Cable, Corrugated Beam or Box Beam Guide Railing and Median Barrier. The quantity to be measured for payment will be in feet to the nearest meter of guide railing or median barrier installed, measured along the axis of the railing and between its pay limits as shown on the plans and/or standard sheets. The quantity to be measured for payment will be in meter to the nearest meter of shop bent or shop mitered railing or median barrier installed.

If the railing does not terminate at an anchorage unit, end assembly, or transition to another type of barrier, but is anchored to a structure, the railing will be measured up to the structure.”

Page 512, **Delete** the second paragraph of §606-5.01 and **Replace** it with the following:

“ Payment for corrugated guide rail and median barrier, or bent box beam guide rail, will be determined using the payment factors for the various typical post spacings listed in Table 606-2. Payment will be the sum of the products obtained by multiplying the unit price bid for a rail or median barrier by the payment factors listed in Table 606-2 for the relevant post spacings and multiplying each of those products by the length of rail having that given post spacing.

Payment for mitered box beam and median barrier with 1830 mm post spacings will be made at the unit prices bid. If a reduced post spacing of 915 mm is used for mitered box beam guide rail, the payment will be determined by multiplying the unit price bid by a payment factor of 1.1 for the length installed.”

Page 515, **Remove** the following items from the list of pay items

606.100001	Box Beam Guide Railing (Shop Curved)
606.100101	Box Beam Guide Railing With Extra Long Posts (Shop Curved)
606.110001	Box Beam Median Barrier (Shop Curved)

Page 515, **Add** the following pay items:

606.100002	Box Beam Guide Railing (Shop Bent or Shop Mitared)	Meter
606.100003	Box Beam Guide Railing (Shop Mitared)	Meter
606.100102	Box Beam Guide Railing with Extra Long Posts (Shop Bent or Shop Mitared)	Meter
606.100103	Box Beam Guide Railing with Extra Long Posts (Shop Mitared)	Meter

SECTION 606 – GUIDE RAILING

606.110002	Box Beam Median Barrier (Shop Bent or Shop Mitered)
606.110003	Box Beam Median Barrier (Shop Mitered)

Meter
Meter

Page 819, §710-21 **BOX BEAM GUIDE RAILING AND MEDIAN BARRIER**, Insert the following section immediately prior to **BASIS OF ACCEPTANCE**:

"FABRICATION. Curved box beam guide rail or median barrier shall be shop bent or shop mitered in accordance with the following. At the fabricator's option, the shop mitering process may be used instead of a shop bending process. However, shop bending may not be used in place of shop mitering.

1. Shop Bent Box Beam Guide Railing. Box beam guide rail installed on a curved alignment with a radius above 6 m and up to 220 m shall be shop bent prior to galvanizing. In order to achieve a smooth arc, the bend points shall be placed no farther apart than 0.6 m when the radius is between 6 and 15 m, no farther apart than 0.9 m when the radius is from 15 and 45 m, and no farther apart than 1.2 m when the radius is 45 m or greater.

2. Shop Mitered Box Beam Guide Railing. Box beam guide railing installed on a curved alignment with a radius of 6 m or less shall be miter cut and welded in the shop prior to galvanizing. For radii less than 3.6 m, the average spacing of the cuts shall be approximately 0.45 m. For radii from 3.6 to 6 m, the average spacing of the cuts shall not exceed 0.6 m. Cut locations shall be adjusted as needed to avoid bolt holes and post brackets. After the miter cuts are completed, backer bars shall be tack welded to one side of the cut and the miter shall be closed to within 6 mm (+ 0, -3 mm) and butt welding performed in accordance with AWS D1.1. Section 3.

3. Shop Bent Median Box Beam Barrier. Box beam median barrier installed on a curved alignment with a radius over 9 and up to 465 m shall be shop bent prior to galvanizing. For radii between 9 and 18 m, the bending shall be performed prior to cutting the slots for the post support paddles. In order to achieve a smooth arc, the bend points shall be placed no farther apart than 0.6 m.

4. Shop Mitered Box Beam Median Barrier. Box beam median barrier installed on a curved alignment with a radius of 9 m or less shall be miter cut and welded in the shop prior to galvanizing. For radii less than 3.6 m, the average spacing of the cuts shall be approximately 0.45 m. For radii of 3.6 m or greater, the average spacing of the cuts shall not exceed 0.6 m. Cut locations shall be adjusted as needed to avoid post support slots. After the miter cuts are completed, backer bars shall be tack welded to one side of the cut and the miter shall be closed to within 6 mm (+ 0, -3 mm) and butt welding performed in accordance with AWS D1.1. Section 3."